California Air Resources Board

# PUBLIC MEETING AGENDA

November 20-21, 2003
9:00 a.m. / 8:30 a.m.

03-9-1 Public Meeting to Consider a Health Update

03-9-2 Public Hearing to Consider the Adoption of the Stationary Compression Ignition Engine Airborne Toxics Control Measure

03-9-3 Public Meeting to Consider the Draft Report, "Planned Air Pollution Research, Fiscal Year 2003-2004"

03-9-4 Public Meeting to Update the Board on the Climate Change Regulations

Includes AcrobatTM ReaderTM

PC and Mac Compatible

California Environmental Protection Agency

# ELECTRONIC BOARD BOOK

California Environmental Protection Agency

# Air Resources Board

## PUBLIC MEETING AGENDA

LOCATION:

California Environmental Protection Agency
Air Resources Board
Central Valley Auditorium, Second Floor
1001 I Street
Sacramento, CA 95814

This facility is accessible by public transit. For transit information, call: (916) 321-BUSS, website www.sacrt.com (This facility is accessible to persons with disabilities.)

November 20-21, 2003
9:00 a.m./8:30 a.m.

03-9-1 **Public Meeting to Consider a Health Update**
*Staff will provide a brief review of the results of the recent study characterizing children's school bus exposures.*

03-9-2 **Public Hearing to Consider the Adoption of the Stationary Compression Ignition Engine Airborne Toxics Control Measure**

*Staff will propose emission standards, operating hour limitations, fuel requirements, and recordkeeping/reporting requirements for new and existing (installed before January 1, 2005) stationary diesel-fueled compression ignition engines.*

03-9-3 **Public Meeting to Consider the Draft Report, "Planned Air Pollution Research, Fiscal Yeal 2003-2004"**

*Staff will recommend approval for the Air Resources Board's extramural research program for Fiscal Year 2003-2004.*

03-9-4 **Public Meeting to Update the Board on the Climate Change Regulations**

*Staff will provide the Board with the progress made towards the development of proposed regulations to reduce climate change emissions from motor vehicles.*

**CONTACT CLERK OF THE BOARD, 1001 I Street, 23rd Floor, Sacramento, CA 95814** **(916) 322-5594**
**FAX: (916) 322-3928**
**ARB Homepage: www.arb.ca.gov**

To submit written comments on an agenda item in advance of the meeting.
To request special accommodations for those persons with disabilities (at least 7 days prior to the meeting date please).
For persons with a hearing or speech impairment, please use our telephone device for the deaf
**TDD: (916) 324-9531 or (800) 700-8326.**

**SMOKING IS NOT PERMITTED AT MEETINGS OF THE CALIFORNIA AIR RESOURCES BOARD**

**CLOSED SESSION - LITIGATION**

*The Board will hold a closed session as authorized by Government Code section 11126(e) to confer with, or receive advice from, its legal counsel regarding the following pending litigation:*

*State of California v. United States Environmental Protection Agency, U.S. Court of Appeal for the District of Columbia Circuit No. 03-1362.*

*State of California v. United States Environmental Protection Agency, U.S. Court of Appeal for the District of Columbia Circuit No. 03-1366.*

**OPEN SESSION TO PROVIDE AN OPPORTUNITY FOR MEMBERS OF THE PUBLIC TO ADDRESS THE BOARD ON SUBJECT MATTERS WITHIN THE JURISDICTION OF THE BOARD**

Although no formal Board action may be taken, the Board is allowing an opportunity to interested members of the public to address the Board on items of interest that are within the Board's jurisdiction, but that do not specifically appear on the agenda. Each person will be allowed a maximum of five minutes to ensure that everyone has a chance to speak.

**THE AGENDA ITEMS LISTED ABOVE MAY BE CONSIDERED IN A DIFFERENT ORDER AT THE BOARD MEETING.**

California Environmental Protection Agency

# Air Resources Board

## PUBLIC MEETING AGENDA

LOCATION:

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November 20-21, 2003
9:00 a.m./8:30 a.m.

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| 03-9-2 | **Public Hearing to Consider the Adoption of the Stationary Compression Ignition Engine Airborne Toxics Control Measure** | **1-520** |
| 03-9-3 | **Public Meeting to Consider the Draft Report, "Planned Air Pollution Research, Fiscal Yeal 2003-2004"** | **521-558** |

**CONTACT CLERK OF THE BOARD, 1001 I Street, 23rd Floor, Sacramento, CA 95814** **(916) 322-5594**
**FAX: (916) 322-3928**
**ARB Homepage: www.arb.ca.gov**

To submit written comments on an agenda item in advance of the meeting.
To request special accommodations for those persons with disabilities (at least 7 days prior to the meeting date please).
For persons with a hearing or speech impairment, please use our telephone device for the deaf **TDD: (916) 324-9531 or (800) 700-8326.**

**SMOKING IS NOT PERMITTED AT MEETINGS OF THE CALIFORNIA AIR RESOURCES BOARD**

# TITLE 17. CALIFORNIA AIR RESOURCES BOARD

## NOTICE OF PUBLIC HEARING TO CONSIDER THE ADOPTION OF A PROPOSED AIRBORNE TOXIC CONTROL MEASURE FOR STATIONARY COMPRESSION IGNITION ENGINES

The Air Resources Board (ARB or Board) will conduct a public hearing at the time and place noted below to consider adopting an airborne toxic control measure (ATCM) to reduce public exposure to diesel particulate matter (PM) and to control criteria pollutants emitted from stationary diesel-fueled, compression-ignition engines (stationary diesel engines). The control measure would reduce diesel PM and control criteria pollutant emissions through a combination of limits on annual operating hours and application of best available control technology. Owners, operators, sellers, buyers, and long-term renters of stationary diesel engines would be subject to and have responsibilities under the control measure. This notice summarizes the proposed control measure. The staff report presents the control measure in greater detail.

DATE: November 13, 2003

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Central Valley Auditorium, Second Floor
1001 I Street
Sacramento, California 95814

This item will be considered at a two-day meeting of the ARB, which will commence at 9:00 a.m., November 13, 2003, and may continue at 8:30 a.m., November 14, 2003. This item may not be considered until November 14, 2003. Please consult the agenda for the meeting, which will be available at least 10 days before November 13, 2003, to determine the day on which this item will be considered.

If you have special accommodation or language needs, please contact the ARB's Clerk of the Board at (916) 322-5594 or sdorais@arb.ca.gov as soon as possible. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

## INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

**Sections Affected:** Proposed adoption of new section 93115, title 17, California Code of Regulations (CCR). The following documents are incorporated herein by reference: (1) American Society for Testing and Materials (ASTM) Standards D 613-03b, D 975-03, D 1655-02 ; (2) *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines*, dated October 2000; (3) Air Force Space Command Instruction 21-0114, dated March 27, 2000; (4) Office of the Chief of Naval Operations (OPNAV)

Instruction 1500.51B, dated March 31, 1989; (5) Military Specifications MIL-DTL-5624T, dated September 18, 1998, and MIL-T-83133E, dated April 1, 1999; (6) *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines,* 13 CCR 2700-2710; (7) *Exhaust Emission Standards and Test Procedures – Off-Road Compression-Ignition Engines,* 13 CCR 2423; (8) National Fire Protection Association *(NFPA) 25 - Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 1998; (9) 2001 California Building Code, 24 CCR Part 2, Vol. 2, Chapter 35 (Uniform Building Code Standards); (10) California Air Resources Board (ARB) Method 5, *Determination of Particulate Matter Emissions from Stationary Sources,* as amended July 28, 1997; (11) California Air Resources Board (ARB) Method 100, *Procedures for Continuous Gaseous Emission Stack Sampling,* as amended July 28, 1997; and (12) International Organization for Standardization (ISO) Methods 8178-1:1996(E), 8178-2:1996(E), and 8178-4:1996(E).

**Background**

The California Toxic Air Contaminant Identification and Control Program (Program), established under California law by Assembly Bill 1807 (Stats. 1983, Ch. 1047) and set forth in Health and Safety Code (H&SC) sections 39650–39675, requires the ARB to identify and control air toxicants in California. In 1998, the Board identified diesel particulate matter as a toxic air contaminant (TAC) with no Board-specified threshold exposure level.

Following the identification of a substance as a TAC, H&SC section 39665 requires the ARB, with participation of the air pollution control and air quality management districts (districts) and in consultation with affected sources and interested parties, to prepare a report on the need and appropriate degree of regulation for that substance. H&SC section 39665(b) requires that this "needs assessment" address, among other things, the technological feasibility of proposed ATCMs and the availability, suitability, and relative efficacy of substitute products or processes of a less hazardous nature.

A needs assessment for diesel PM was conducted between 1998 and 2000, which resulted in the ARB's development of the Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles (Diesel RRP). The Diesel RRP presented information that identified the available options for reducing diesel PM and recommended control measures to achieve further reductions. The scope of the Diesel RRP was broad, addressing all categories of engines, both mobile and stationary. For stationary diesel engines, the Diesel RRP identified and recommended the development of this proposed ATCM. ARB staff has prepared an Initial Statement of Reasons (ISOR or staff report) for the proposed ATCM that, together with the Diesel RRP, serves as the report on the need and appropriate degree of regulation for the proposed ATCM.

Once the ARB has evaluated the need and appropriate degree of regulation for a TAC, H&SC section 39666(c) requires the ARB to adopt regulations (ATCMs) to reduce emissions of the TAC to the lowest level achievable through the application of best available control technology (BACT) or a more effective control method, in consideration of cost, risk, environmental impacts, and other specified factors. In developing the proposed ATCM, State law also requires an assessment of the appropriateness of substitute products or processes.

Stationary diesel engines emit approximately 910 tons per year of diesel PM. These engines are distributed throughout California, and many are located in urban centers where the population is exposed to diesel PM emissions. The proposed ATCM is designed to minimize the public's exposure to diesel PM by establishing stringent operational requirements and emission limits for these engines.

In addition to emitting TACs, stationary diesel engines also emit criteria pollutants such as oxides of nitrogen (NOx), oxides of sulfur (SOx), carbon monoxide (CO), and non-methane hydrocarbons (NMHC). Emissions of these criteria pollutants contribute to violations of applicable California and national ambient air quality standards (CAAQS and NAAQS, respectively). To control criteria pollutant emissions, H&SC section 43013(b) directs the ARB to adopt standards and regulations for nonvehicle engine categories, including but not limited to construction equipment, farm equipment, and utility engines. Because they are nonvehicle engines, stationary diesel engines subject to the proposed ATCM are covered by this mandate.

**Description of the Proposed Regulatory Action**

*Applicability*

With enumerated exceptions, the proposed ATCM would apply to any person who owns, operates, sells, offers for sale, leases, or buys a regulated stationary diesel engine for use in California. In general, a stationary diesel engine is one that remains in one location at a facility for more than 12 months. A new engine is one that is installed after January 1, 2005, while an in-use engine is one that is installed prior to January 1, 2005. The proposed ATCM has separate provisions for engines that are no more than 50 brake horsepower (bhp) and engines that are greater than 50 bhp.

*Initial and Annual Reporting Requirements*

Owners and operators of existing stationary diesel engines rated greater than 50 bhp would be required to submit to the air districts specified information regarding their engines' make, model, fuel use, general use of the engine, and hours of operation. This information would be due no later than July 1, 2005.

Sellers of stationary diesel engines that are less than or equal to 50 bhp or engines used in agricultural operations would be required to submit to the ARB information identifying the types of engines sold and the number of engines sold per year. This information would be due no later than January 1, 2006 and annually thereafter for the prior year.

*Bifurcated Standards and Requirements Based on Horsepower*

For new engines that are less than or equal to 50 bhp, the ATCM requires compliance with the current Off-Road Compression Ignition Engine Standards (Title 13 CCR Section 2423) applicable to an engine of the same brake horsepower rating and model year. These standards represent best available control technology for this category of engines. The ATCM would not require retrofits for any in-use engines in this horsepower category.

For engines that are greater than 50 bhp, the proposed ATCM establishes different requirements for emergency standby engines and prime engines, which are engines used in non-emergency applications. Separate requirements are also established for engines used in agricultural operations.

*Clean Fuel Use Requirement*

By January 1, 2005, all stationary diesel engines greater than 50 bhp would be required to use either CARB diesel or a "clean" alternative, which includes CARB diesel/CNG (compressed natural gas) dual-fuel systems and alternative diesel fuels that have met the requirements of the ARB's Verification Procedure (Title 13 CCR 2700-2710).

*Requirements for Emergency Standby Engines*

An emergency standby engine is used to provide power during an electrical power outage; to provide for the emergency pumping of water during a flood or for fire suppression; or to power high-power, airport runway lights under low-visibility conditions. Because emergencies are generally infrequent, an emergency standby engine mostly operates during scheduled maintenance and testing periods. Rather than limiting the hours of engine operation during an emergency, the proposed ATCM would establish different diesel PM standards for both new and in-use emergency standby engines based on the number of maintenance and testing hours these engines are operated annually.

To provide flexibility for engine owners while ensuring that public exposure to diesel PM is minimized, the tiered diesel PM standards become more stringent as the annual hours of maintenance and testing operation increase. For example, an in-use engine that emit between 0.15 and 0.4 grams diesel PM per brake horsepower-hour (g/bhp-hr) would be permitted to run up to 30 hours annually for maintenance and testing. By contrast, an in-use engine that emits more than 0.40 g/bhp-hr would be permitted only 20 hours annually for maintenance and testing.

In addition to the diesel PM limits, the proposed ATCM would restrict criteria pollutant emissions by requiring new emergency standby engines to meet current Off-Road Compression Ignition Engine Standards. The ATCM would also prohibit in-use emergency standby engines from increasing criteria pollutant emissions when controlling diesel PM emissions.

*Requirements for Prime Engines*

A prime diesel engine can be used in a wide variety of non-emergency applications. These include remote power generation, cranes, sand and gravel processing, and the pumping of fluids. Prime engines typically operate many more hours per year than emergency standby engines. Because of this, the ATCM would require prime engines to meet much more stringent emission limits than emergency standby engines. New prime engines would be limited to 0.01 g/bhp-hr of diesel PM, while in-use prime engines (that are off-road certified) would need to either meet the 0.01 g/bhp-hr standard or reduce diesel PM emissions by 85 percent from baseline levels. In-use prime engines that are not off-road certified would be given the option of either meeting the 0.01 g/bhp-hr standard or reducing diesel PM emissions by 30 percent (relative to baseline levels) by 2005 then replacing the engine in 2013 with an engine that emits no greater than 0.01 g/bhp-hr.

As with the requirements for emergency engines, the proposed ATCM restricts the criteria pollutant emissions by requiring new prime engines to meet current Off-Road Compression Ignition Engine Standards. In-use prime engines would be prohibited from increasing criteria pollutant emissions when controlling diesel PM. Because the ATCM focuses on applying best available control technology to prime engines, it does not limit the number of hours new and in-use prime engines may operate.

*Requirements for Engines Used in Agricultural Operations*

The proposed ATCM also establishes separate diesel PM emission limits for new stationary diesel engines used in agricultural operations. These engines would be limited to diesel PM emissions of no greater than 0.15 g/bhp-hr. To control criteria pollutants, new agricultural engines would need to meet the Off-Road Compression Ignition Engine Standards applicable to engines of the same size and model year. In this proposal, the ATCM would not apply restrictions to in-use engines in agricultural operations. However, the ARB staff will continue investigating retrofit controls and other opportunities for future emission reductions from these engines.

*Exemptions and Other Provisions*

The proposed ATCM establishes a number of exemptions from some or all of the operational requirements and emission limits discussed in the previous paragraphs. The proposed ATCM also contains sections addressing recordkeeping and reporting, monitoring equipment, compliance schedules, definitions, emissions data, and test methods.

There are no federal regulations that are comparable to the proposed ATCM.

*Additional Provisions Under Consideration*

The ARB staff is currently considering language that would address diesel PM and criteria pollutants from stationary diesel engines operating under interruptible service contracts (ISC). Some engine owners have entered into ISCs with electric utilities to reduce their electrical demand when requested by the utilities in exchange for reduced electricity prices or other non-monetary consideration. Provisions to address these engines have been considered in prior workshops, but the exact language has not yet been developed. ARB staff will continue further development of such language during the 45-day comment period leading up to the Board hearing starting on November 13, 2003. If the provisions are finalized by that time, the ARB staff will present such language as a modification to the proposed ATCM for the Board's consideration at the hearing. As described below, an additional 15-day comment period will then be provided if the Board adopts either the ISC language proposed by ARB staff or a different version.

The ARB staff is also considering language that would define violations of the ATCM requirements and specify the applicable penalties. If the violation and penalties provisions are finalized before the Board hearing, the ARB staff will present such language as a modification to the proposed ATCM for the Board's consideration at the hearing. As noted previously, an additional 15-day comment period will then be provided if the Board adopts either the violations and penalties provision proposed by ARB staff or a different version.

## AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The Board staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the potential environmental and economic impacts of the proposal, if any. The ISOR is entitled, "Staff Report: Initial Statement of Reasons for the Proposed Airborne Toxic Control Measure for Stationary CI Engines."

Copies of the ISOR and the full text of the proposed regulatory language may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990 at least 45 days prior to the scheduled hearing which will begin on November 13, 2003.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on the web site listed below.

Inquiries concerning the substance of the proposed regulations may be directed to the designated agency contact persons, Peggy Taricco, Manager of the Technical Analysis Section, at (916) 327-7213 or by email at ptaricco@arb.ca.gov, or Alex Santos, Staff Air Pollution Specialist, at (916) 327-5638 or by email at asantos@arb.ca.gov.

Further, the agency representative and designated back-up contact persons to whom nonsubstantive inquiries concerning the proposed administrative action may be directed are Artavia Edwards, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-6070, and Alexa Malik, Regulations Coordinator, (916) 322-4011. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

If you are a person with a disability and desire to obtain this document in an alternative format, please contact the Air Resources Board ADA Coordinator at (916) 323-4916, or TDD (916) 324-9531, or (800) 700-8326 for TDD calls from outside the Sacramento area.

This notice, the ISOR and all subsequent regulatory documents, including the FSOR, when completed, are available on the ARB Internet site for this rulemaking at http://www.arb.ca.gov/regact/statde/statde.htm.

## COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed regulations are presented below.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action will not create costs or savings to any state agency or in federal funding to the state, costs or mandate to any local agency or school district whether or not reimbursable by the state pursuant to Part 7 (commencing with section 17500), Division 4, Title 2 of the Government Code, except as discussed below, or other nondiscretionary savings to state or local agencies.

While there are no impacts for fiscal years (FYs) 2003 and 2004, the proposed ATCM will impose a mandate upon and create costs to some local agencies for fiscal year 2005 and beyond. For FYs 2005-2009, local agencies operating diesel engines regulated under the proposed ATCM will need to spend approximately $1.10 million per year. These costs are not reimbursable state mandated costs pursuant to Part 7 (commencing with section 17500), Division 4, Title 2 of the Government Code because most, if not all, of these agencies are authorized to collect fees to recoup their costs under Section 17500, et seq., of the Government Code, and the ATCM applies to all entities that own or operate stationary diesel engines and, therefore, does not impose unique requirements on local government agencies.

The Executive Officer has also determined that State government agencies with regulated engines will not incur costs during FYs 2003 and 2004. However, it is anticipated that State agencies will incur an annualized cost of about $20,600 per year for FYs 2005 through 2009. This is the aggregate cost for all affected State agencies and represents the annualized capital cost and annual recurring cost savings from reduced fuel use. Given the current fiscal and economic conditions, the Executive Officer cannot determine with certainty whether State agencies will be able to absorb these additional costs within current or future budgets, but it is anticipated that the agencies will be able to absorb annualized costs of this magnitude.

The Board's Executive Officer has also determined that individual local air districts may incur some permitting and enforcement costs as a result of implementing the proposed ATCM. However, the costs incurred by the air districts are not reimbursable state mandated costs because of the districts' authority to recover the costs through fee assessments authorized under H&SC sections 41512 and 42311.

In developing this regulatory proposal, the ARB staff evaluated the potential economic impacts on representative private persons or businesses. The ARB is not aware of any cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

The Executive Officer has made an initial determination that the proposed regulatory action will not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action will not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California.

The Executive Officer has also determined, pursuant to title 1, CCR, section 4, that the proposed regulatory action will have some impact, although not significant, on small businesses that own or operate affected stationary diesel engines. During the initial years of implementation, the increased cost of equipment may lead to lower profits for some small businesses, primarily those operating prime engines.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the ARB's Executive Officer has found that the reporting requirements of the regulation that apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

In accordance with H&SC 43013(c), the Executive Officer has determined that the standards and other requirements in the proposed ATCM are necessary, cost-effective, and technologically feasible for stationary diesel engines used in agricultural operations (i.e., farm equipment).

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the agency or that has otherwise been identified and brought to the attention of the agency would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.

A detailed assessment of the economic impacts of the proposed regulatory action can be found in the Staff Report.

## SUBMITTAL OF COMMENTS

The public may present comments relating to this matter orally or in writing at the hearing, and in writing or by e-mail before the hearing. To be considered by the Board, written submissions must be received **no later than 12:00 noon, November 12, 2003**, and addressed to the following:

Postal mail is to be sent to:

Clerk of the Board
Air Resources Board
1001 I Street, 23rd Floor
Sacramento, California 95814

Electronic mail is to be sent to: statde@listserv.arb.ca.gov, and received at the ARB **no later than 12:00 noon, November 12, 2003**.

Facsimile submissions are to be transmitted to the Clerk of the Board at (916) 322-3928 and received at the ARB **no later than 12:00 noon, November 12, 2003**.

The Board requests but does not require 30 copies of any written submission. Also the ARB requests that written, facsimile, and e-mail statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The ARB encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

## STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under the authority granted to the ARB in Health and Safety Code sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013. This action is proposed to implement, interpret, or make specific Health and Safety Code sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

## HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, Title 2, Division 3, Part 1, Chapter 3.5 (commencing with section 11340) of the Government Code.

Following the public hearing, the ARB may adopt the regulatory language as originally proposed or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the proposed regulatory action. In the event that such modifications are made, the full regulatory text, with the modifications clearly indicated, will be made available to the public for written comment at least 15 days before it is adopted.

The public may request a copy of the modified regulatory text from the ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, California 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD

Catherine Witherspoon
Executive Officer

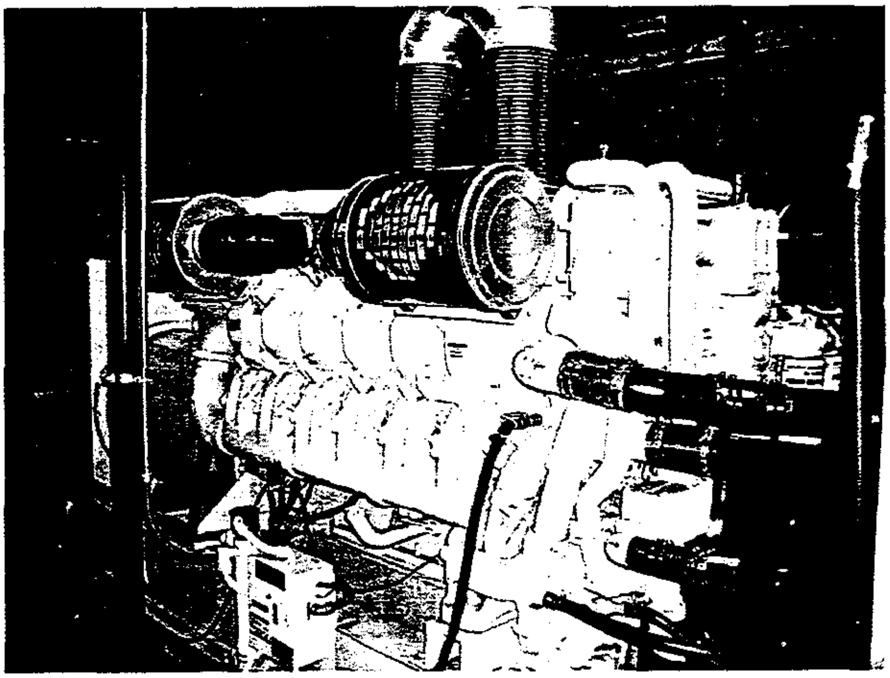
Date: September 16, 2003

*"The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Web-site at www.arb.ca.gov."*

California Environmental Protection Agency

AIR RESOURCES BOARD

# STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING



# AIRBORNE TOXIC CONTROL MEASURE FOR STATIONARY COMPRESSION-IGNITION ENGINES

Stationary Source Division
Emissions Assessment Branch

September 2003

**State of California**
**AIR RESOURCES BOARD**

# STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

**Public Hearing to Consider**

## ADOPTION OF THE PROPOSED AIRBORNE TOXIC CONTROL MEASURE FOR STATIONARY COMPRESSION-IGNITION ENGINES

To be considered by the Air Resources Board on November 13-14, 2003, at:

California Environmental Protection Agency
Headquarters Building
1001 "I" Street
Central Valley Auditorium
Sacramento, California

Stationary Source Division:
Peter D. Venturini, Chief
Robert D. Barham, Assistant Chief
Emissions Assessment Branch:
Daniel E. Donohoue, Chief
Technical Analysis Section:
Peggy Taricco, Manager

**State of California**
**AIR RESOURCES BOARD**

# PROPOSED AIRBORNE TOXIC CONTROL MEASURE FOR STATIONARY COMPRESSION-IGNITION ENGINES


## Contributing Authors

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## Supporting Divisions

PTSD, RD, MSCD, MLD



## Acknowledgements

This report was prepared with the assistance and support from the other divisions and offices of the Air Resources Board. In addition, we would like to acknowledge the assistance and cooperation that we have received from many individuals and organizations.

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## EXECUTIVE SUMMARY

The Air Resources Board (ARB or Board), in addition to maintaining long-standing efforts to reduce emissions of ozone precursors, is now challenged to reduce emission of diesel particulate matter. In 1998, the Board identified diesel particulate matter (diesel PM) as a toxic air contaminant (TAC). Because of the amount of emission to California's air and its potency, diesel PM is by far the number one contributor to the adverse health impacts of TACs.

Diesel exhaust is a complex mixture of thousands of gases and fine particles that contains more than 40 identified TACs. These include many known or suspected cancer-causing substances, such as benzene, arsenic and formaldehyde. In addition to increasing the risk of lung cancer, exposure to diesel exhaust can have other health effects as well. Diesel exhaust can irritate the eyes, nose, throat and lungs, and it can cause coughs, headaches, light-headedness and nausea. Diesel exhaust is a major source of fine particulate pollution as well and numerous studies have linked elevated particle levels in the air to increased hospital admissions, emergency room visit, asthma attacks and premature deaths among those suffering from respiratory problems.

To reduce public exposure to diesel PM, the Board approved in 2000 the Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles (Diesel Risk Reduction Plan). This comprehensive plan outlined steps to reduce diesel emissions from both new and existing diesel-fueled engines and vehicles. The goal of the Diesel Risk Reduction Plan is to reduce diesel PM emissions and associated potential cancer risks by 75 percent in 2010 and by 85 percent by 2020.

As part of the effort to reduce diesel PM, ARB staff is proposing an airborne toxic control measure (ATCM) to reduce diesel PM emissions from stationary diesel-fueled compression ignition engines. The proposed ATCM is one of many ATCMs that will be considered by the ARB over the next several months to fulfill the goals of the Diesel Risk Reduction Plan. The ATCMs being proposed include ATCMs to reduce emissions from residential and commercial solid waste collection vehicles, fuel cargo delivery trucks, transport refrigeration units, and portable engines.

Presented below is an overview which briefly discusses the emissions from new and existing stationary engines, the proposed ATCM and the potential impacts from implementation as well as what our plans are for future activities. For simplicity, the discussion is presented in question-and-answer format using commonly asked questions about the ATCM. It should be noted that this summary provides only brief discussion on these topics. The reader is directed to subsequent chapters in the main body of the report for more detailed information.

## 1. What is ARB staff proposing?

ARB staff is proposing an ATCM that will limit the emissions of diesel PM from many new and existing stationary diesel-fueled compression ignition (CI) engines. Unlike diesel-fueled CI engines used in on- and off-road applications, diesel-fueled engines used in stationary applications are currently not required to meet state or federal engine certification standards. Under Title I of the Federal Clean Air Act, states are fully authorized to establish standards for stationary engines, and these engines are not affected by Section 209(e) provisions of the Act, which may require a waiver from the United States Environmental Protection Agency (U.S. EPA) when establishing requirements for mobile non-road engines.

The proposed ATCM establishes emission standards, including a standard for diesel PM emissions, that sellers of stationary diesel-fueled engines would have to meet. The proposed ATCM also establishes emission standards and operational requirements that the owners or operators of stationary diesel-fueled CI engines that have a rated horsepower rating of greater than 50, would have to meet. The requirements can be grouped into three general categories: fuel use requirements, operational requirements and emission standards, and recordkeeping, reporting, and monitoring requirements. The proposed ATCM will also require specified classes of stationary engines to meet the off-road engine standards in title 13, California Code of Regulations (CCR), section 2423 for other pollutants that contribute to ground-level smog. In general, the goal of these requirements is to have the owners and operators of diesel-fueled engines use the cleanest fuels possible, limit the unnecessary operation of their engines, and control the emissions of diesel PM to the greatest extent possible, in consideration of technical and economic feasibility.

## 2. How did ARB staff develop the ATCM and this report?

The staff developed the proposed ATCM and this report through extensive consultations with industry, government agency representatives, environmental organizations, and members of the public. Over the course of two and a half years, the staff held 10 public workshops and meetings covering numerous drafts, regulatory concepts, and implementation issues. Participating in one or more of the workshops were representatives of local publicly-owned treatment works (POTWs), the California Council for Economic and Environmental Balance (CCEEB), agricultural community representatives, the Association of California Water Agencies, the American Lung Association, the Engine Manufacturers Association, Manufacturers of Emission Controls Association, National Resources Defense Counsel, Environmental Defense, the United States Navy, private businesses and others. Staff also met bimonthly with the California Air Pollution Control Officers Association's Toxics Committee to gain the perspective and input of local air pollution control or air quality management district representatives. Numerous individual meetings were held with affected stakeholders, and staff also researched the literature to better understand retrofit control technologies available to reduce diesel PM emissions from stationary diesel-fueled engines. To further investigate the feasibility of retrofit controls, ARB funded a demonstration program to evaluate and demonstrate diesel PM control technologies for emergency back-up engines and to investigate test methods that can be used to measure PM from stationary engines.

**3. What businesses and public agencies will be affected by the proposed ATCM?**

Both private businesses and public agencies operating stationary diesel-fueled engines in California will be affected by the proposed ATCM. Examples of businesses that potentially will be affected include private schools and universities, private water treatment facilities, hospitals, power generation, communications, broadcasting, building owners, agricultural production, banks, hotels, refiners, resorts, recycling centers, quarries, wineries, dairies, food processing, and manufacturing entities. A variety of public agencies will also be affected including military installations, prisons and jails, public schools and universities, and public water and wastewater treatment facilities.

**4. What are stationary compression ignition engines?**

Stationary compression ignition engines (stationary engines) are engines that remain in one location for 12 months or longer. ARB staff estimates there are about 26,300 stationary diesel-fueled engines operating in California. Stationary engines are typically categorized as either prime engines or emergency standby engines. The majority of the engines, approximately 75 percent or 19,700, are used in emergency standby applications, while the remaining 6,600 engines are considered prime engines. Emergency standby engines are typically used for emergency back-up electric power generation or the emergency pumping of water. Prime engines are stationary engines that are not used in an emergency backup or standby mode. They can be used in a variety of applications including agricultural irrigation, compressors, cranes, and rock crushers. Prime engines can operate several hundred hours per year (i.e., small seasonal rock crushing operations) to several thousand hours per year (i.e., stationary cranes at ports/ship yards).

**5. What are the emissions, exposures, and risk from stationary diesel-fueled engines?**

Stationary engines are used in a variety of applications and are located throughout the State. ARB staff estimates stationary diesel engines emit approximately 2.6 tons per day or 950 tons per year of diesel PM emissions, 40 tons per day of oxides of nitrogen (NOx), and 6 tons per day of reactive organic gases (ROG) in 2002. Based on an average statewide NOx to PM conversion factor, we estimate the secondary formation of $PM_{10}$ nitrate from NOx emissions from diesel-fueled stationary engines to be about four tons per day.

Prime engines account for the majority, about 90 percent, of diesel PM emissions. When all sources of diesel PM are considered, stationary engines account for about four percent of the total diesel PM emissions in California. Because ambient air monitoring techniques for diesel PM are still under development, it is difficult to measure the actual exposures to persons from the emissions of stationary diesel-fueled engines. However, because the engines are distributed throughout California and many of the engines are located in urban centers where the probability of a person living close to an engine is higher, we believe that many Californians are impacted by diesel PM emissions from the operation of stationary diesel-fueled engines in California.

Exposure to these emissions results in increased cancer risk and health risks from other non-cancer health impacts, such as irritation to the eyes and lungs, allergic reactions in the lungs, asthma exacerbation, blood toxicity, immune system dysfunction, and developmental disorders. Because monitoring results are not available for diesel PM, estimates of the level of cancer risk are made using emission factors and various modeling techniques. Based on a health risk assessment, using reasonable assumptions bracketing a fairly broad range of possible operating and exposure scenarios for stationary engines, we determined that exposures to the diesel PM emissions from stationary diesel-fueled engines can result in significant near source risks. For example, a typical emergency standby engine operating 100 hours a year for maintenance and testing can result in a potential cancer risk of over 30 potential cancer cases in a million for a nearby residence. A similar engine operating in a prime mode for 2000 hours a year can result in a cancer risk of over 650 potential cancer cases in a million. These risk values assume exposure duration of 70 years for a nearby individual.

## 6. What does the proposed ATCM require?

The proposed ATCM establishes requirements that affect the sellers, owners, and operators of diesel-fueled CI engines that are used in stationary applications. As required by State law, our approach in developing the emission standards and operational limits was to establish requirements that are based on the application of the best available control technology (BACT) and operational practices for diesel PM. The following paragraphs summarize the key requirements of the proposed ATCM.

<u>Initial Reporting Requirements</u>

- Owners or operators of existing stationary CI engines having a horsepower rating greater than 50 (> 50 hp) are required to submit information to the local air districts identifying each engine's make and model, fuel and fuel usage rate, general use and typical hours of operation. This information is due to the districts no later than July 1, 2005.
- Sellers of stationary diesel-fueled engines that are to be used in agricultural applications (i.e., pumps), or that have a rated horsepower of less than or equal to 50 ($\leq$ 50), are required to submit to the ARB information identifying the types of engines sold and number of engines sold per year. This information is due to the ARB no later than January 1, 2006, and annually thereafter for the prior calendar year.

Fuel Use Requirements

- By January 1, 2005, all stationary diesel-fueled CI engines > 50 hp are required to use CARB diesel or a "clean" alternative. "Clean" alternative fuels include CARB diesel/CNG dual-fuel systems and alternative diesel fuels that have met the requirements of the ARB's Verification Procedure.

Emission Standards and Operating Requirements

The proposed diesel PM emission standards and operation limits for new and in-use stationary diesel-fueled engines are briefly discussed below and summarized in Tables E-1 and E-2.

- The proposed ATCM establishes emission standards for stationary diesel-fueled CI engines ≤ 50 hp, sold for use in California. BACT for these engines is the applicable Off-Road Engine PM Certification Standard in title 13, CCR, section 2423.
- *For stationary diesel-fueled CI engines > 50 hp used in* emergency standby applications (e.g., emergency generator sets and fire pumps), BACT consists of specific diesel PM emission standards and limits on the number of hours the engine must meet more stringent operate for maintenance and testing purposes. Generally, new engine applications must more stringent standards than in-use engine applications. As permitted under State law, the local air pollution control districts may establish more stringent alternative emission standards and hour limitations, on a site-specific basis.
- For stationary diesel-fueled CI engines > 50 hp used in prime applications (e.g., shipyard cranes and rock crushers), BACT consists of specific diesel PM emission standards. New engine applications are held to more stringent standards than in-use engine applications. In-use engines that are not certified off-road engines and for which highly effective PM retrofit controls are unavailable have the option of reducing diesel PM emissions by 30 percent in the near term and meeting a 0.01 g/bhp-hr (proposed Tier 4) PM emission standard in 2011. As permitted under State law, the local air pollution control districts may establish more stringent alternative emission standards and hour limitations.
- The proposed ATCM establishes emission standards for new stationary diesel-fueled CI engines sold for use in agricultural operations. BACT for these engines is 0.15 g/bhp-hr or the applicable Off-Road Engine PM Certification standard, whichever is more stringent.
- For new engines, both ≤ 50 and > 50 hp, the requirements are effective as of July 1, 2005. Owners and operators of in-use engines that elect to comply by reducing hours of operation must do so by January 1, 2005. For in-use engines that require the installation of add-on controls, the requirements are phased in over a four-year period (2006 to 2009), depending on the age and number of engines an owner has.

**Table E-1: Summary of Proposed Diesel PM Standards and Operating Limits for New Engines**

| Engine Applications | Diesel PM Emission Limit (g/bhp-hr*) | Annual Hours of Operation Limit for Maintenance and Testing |
|---|---|---|
| • New Prime Engines | ≤0.01 | None |
| • New Emergency Standby Engines | | 100 (District Discretion) |
| • New Emergency Standby Engines | ≤0.15 | 50 |
| • New Agricultural Operation Engines | | None |
| • New ≤ 50 hp | Applicable off-road standards | None |

*grams per brakehorsepower-hour

**Table E-2: Summary of Proposed Diesel PM Standards and Operating Limits for In-Use Engines**

| Engine Applications | Diesel PM Emission Limit (g/bhp-hr) | Annual Hours of Operation Limit for Maintenance and Testing |
|---|---|---|
| • In-Use Prime Engines | 0.01 or 85% reduction from baseline levels | None |
| • In-Use Prime Engines (not off-road certified) | 30% reduction from baseline levels and meet 0.01 by 2011 | |
| • In-Use Emergency Standby Engines | >0.40 | 20 |
| • In-Use Emergency Standby Engines | >0.15 and ≤ 0.40 | 30 |
| • In-Use Emergency Standby engines | >0.01 and ≤0.15 | 50 (District Discretion) |
| • In-Use Emergency Standby Engines | ≤0.01 | 100 (District Discretion) |
| • In-Use Emergency Standby Direct-Drive Fire Pumps | none | Hours needed to comply with NFPA 25 Standard (26-33 hours) |
| • In-Use ≤ 50 hp | none | none |

## 7. Are the proposed diesel PM emission standards technologically feasible?

Yes. Based upon extensive analysis and discussions with numerous stakeholders, staff has determined that the proposed diesel PM emission standards are technologically feasible.

For engines ≤ 50 hp, the proposed diesel PM emission limit applies to engines sold after January 1, 2005, and is equal to the diesel PM emission limit defined in the Off-Road Compression Ignition Engine Standards (title 13, CCR, section 2423). Since equivalently sized off-road engines must meet these standards, ARB staff concludes that it is technologically feasible for stationary diesel-fueled engines to meet these same standards.[1]

For engines > 50 horsepower, ARB staff believes these standards are achievable for the following reasons:

- Currently, approximately 50 stationary diesel-fueled engines are operating successfully in California with diesel particulate filter control technologies. The engines controlled represent a wide range of engine types, model years (1997-2003), horsepower ratings, and applications.
- The results our stationary engine retrofit demonstration program showed successful application of diesel particulate filters, diesel oxidation catalysts, and emulsified fuels on engines ranging in age from 2 to 18 years old.
- California's Off-Road Compression Ignition Standards, which are equivalent to the Federal Non-Road Diesel Engine Emission Standards, have required newly manufactured off-road engines to meet diesel PM emission standards since 1996. Currently, all newly manufactured off-road diesel-fueled engines are meeting either Tier 1, Tier 2, or Tier 3[2] emission standards, depending on the size of the engine.
  - Newly manufactured off-road engines between 175 and 750 hp are currently required to meet a diesel PM emission standard of 0.15 g/bhp-hr.
  - Newly manufactured off-road engines greater than 750 hp are currently required to meet a diesel PM emission standard of 0.40 g/bhp-hr, but they will be required to meet a diesel PM emission standard of 0.15 g/bhp-hr by 2006.
  - Newly manufactured off-road engines less than 175 hp are held to less stringent standards, but certification data indicate that approximately 18 percent of the off-

[1] In-use emission standards for engines ≤ 50 hp are not being proposed at this time. ARB staff believe there are a limited number of ≤ 50 hp stationary diesel-fueled engines, and because they have never been subject to permitting requirements, there is very little data available. The proposed ATCM will collect data that will allow the development of a more robust inventory, and ARB staff will reassess the need for in-use requirements once that data is available.

[2] Since 1996, manufacturers of diesel engines have been subject to U.S. EPA's nonroad diesel emission regulations (40 CFR Part 89). The nonroad diesel emission standards are tiered (i.e., Tier 1, 2, 3, 4), and the date upon which each tier takes effect depends on the engine size. As of January 1, 2000, all engine sizes were subject to Tier 1 standards. In 2006, all engines sizes will be subject to Tier 2, and in 2008, all engines sizes will be subject to Tier 3 standards. In May 2003, U.S. EPA proposed new Tier 4 emission standards, which will require most engines to meet a 0.01 g/bhp-hr emission rate in the 2011-2014 timeframe.

road certified engines emitted diesel PM at a rate less than or equal to 0.15 g/bhp-hr.

- The annual hour limitations for maintenance and testing of emergency standby engines range from less than 20 hours to 100 hours. ARB survey data and National Fire Protection Association (NFPA) standards indicate that, in most cases, 30 hours per year or less are sufficient to insure the proper operation of an engine when it is needed for emergency service.

**8. How will the ATCM regulate stationary diesel-fueled engines used in agricultural operations?**

The proposed ATCM affects only new agricultural engines at this time and establishes emissions performance standards for new agricultural engines similar to the requirements for new emergency standby engines. New engines meeting the 0.15 g/bhp-hr PM requirement are currently available "off-the-shelf" for all engine horsepower categories greater than 50 hp. However, since the certification standards for the engines in the 50-175 hp range are higher the 0.15 g/bhp-hr PM standard, only a subset of the engines certified in this category will be allowed in California.

At this time, for the reasons stated below, ARB staff is not proposing performance standards or operating hour restrictions for in-use agricultural engines. We are also not proposing to require that new engines in agricultural service meet the 0.01 g/bhp-hr PM standard for prime engines. Emission reductions from in-use agricultural engines have been realized, however, through the Carl Moyer Memorial Air Quality Standards Attainment Program (Carl Moyer Program). In its first three years (through fiscal year 2000/2001), the Carl Moyer Program funded the replacement of over 1,900 stationary agricultural pumps with lower emission engines. Based on local program data from the first three years provided by the districts, ARB staff estimates PM reductions from the Carl Moyer Program to be approximately 65 tons per year.[3] ARB staff will continue to work with the agricultural community to identify how best to further reduce PM and NOx emission from stationary diesel engines in agricultural service. We will be working to improve the agricultural engine inventory, identifying subset of agricultural engines that have the best potential for retrofits, and working with engine manufacturers and control equipment suppliers on a retrofit demonstration program. We anticipate that this effort will be completed January 2005, at which time we will return to the Board with a recommended approach.

Staff's proposal would require new agricultural engines to be the cleanest currently produced by engine manufacturers, but it would not require the installation of retrofit and add-on controls for new or in-use agricultural engines. At this time, it is not practical to require retrofit and add-on controls on new or in-use agricultural engines for several reasons, including:

[3] The San Joaquin Valley Unified Air Pollution Control District recently updated the inventory for agricultural irrigation pumps in the San Joaquin Valley. According to their estimates, as of May 2003, the district has provided funds under the Carl Moyer Program to replace 2,250 diesel-fueled agricultural irrigation pumps.

- Retrofit devices are not readily available for these applications. We believe it would be impractical to require individual owners to have to search out retrofit devices that may be available for his or her engine, obtain an installer, and service and maintain the retrofit device;
- The requirements for retrofits for prime engines need to be implemented via a district permit system to ensure proper design, implementation and enforcement. There is no such system in place for agricultural engines.[4]

We also believe that replacing diesel engines with electric power may be the best long term approach for reducing PM and NOx emissions from stationary agricultural engines. To this end, ARB staff is initiating an effort to work with the agricultural community to determine the feasibility and cost effectiveness of replacing agricultural irrigation pumps with electrically driven pumps. We expect this effort to be completed in the June 2004 timeframe. In addition, ARB staff intends to follow the development of retrofit technologies applicable to agricultural engines. When technically feasible and cost-effective retrofit controls become available, we will propose amendments to the ATCM.

**9. How does the ATCM address stationary engines used in Interruptible Service Contracts (ISCs) or Rolling Blackout Reduction Programs?**

Investor-owned utilities are authorized to offer optional "interruptible or curtailable" electric service to customers at discounted rates. In return, the customer agrees to reduce power consumption from the grid during periods when not enough power is available to meet all demand with an adequate reserve margin. In some cases, customers with ISC operate emergency standby engines to offset the reduction in electrical power from the grid, and in effect, become self-generators of electricity.

During the development of the ATCM, staff considered how the ATCM should address the continued use of emergency standby engines in interruptible programs. Some entities with existing contracts claimed that operating diesel-fueled emergency standby engines was justified because ISC contracts help prevent blackouts which could result in the widespread use of diesel-fueled emergency standby engines during rolling blackouts. Others argued against their use, raising concerns about public exposures to diesel PM and continued reliance on a power source that is orders of magnitude dirtier than a gas-fired plant in terms of pollution produced per megawatt of electricity generator.

A special type of ISC is the Rolling Blackout Reduction Program in San Diego County. Under this program, certain engines that have signed up to participate are asked to voluntarily reduce power when grid power reached critically low levels. In exchange for reducing power from the grid, the company is paid 20 cents a kilowatt for the power demand reduced.

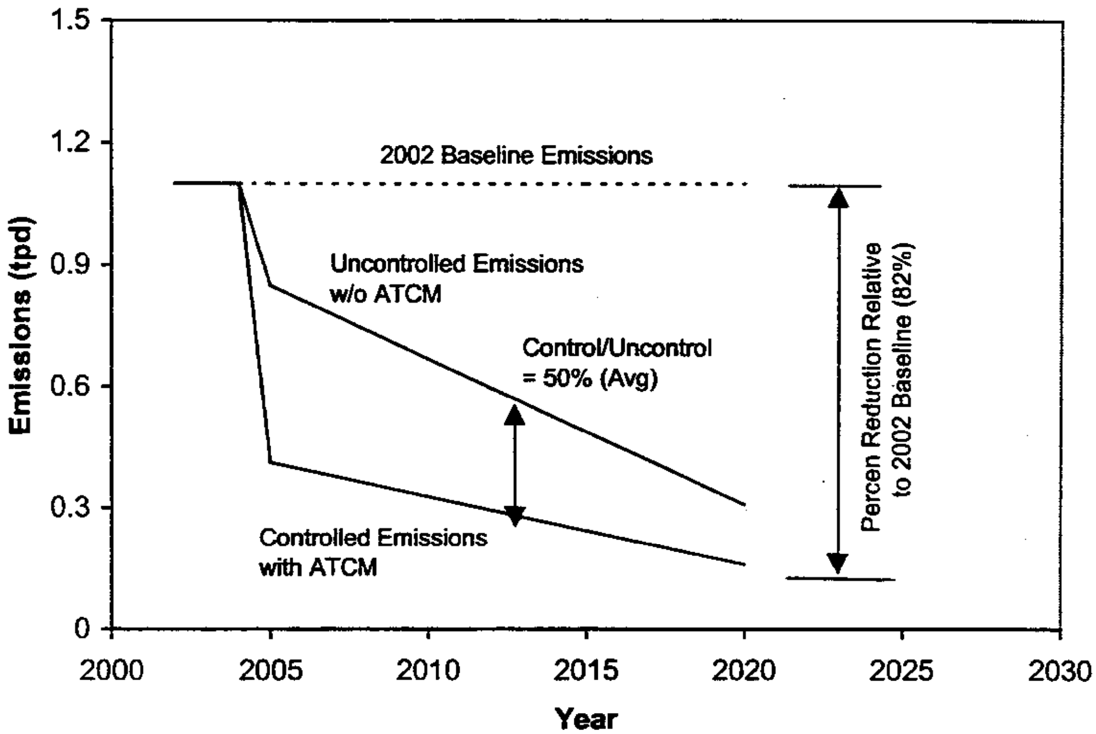
[4] H&SC Section 42310 prohibits Districts from requiring permits for equipment used in agricultural service. However, Senate Bill 700 (SB 700) considered in the 2003-2004 legislative session, would remove this prohibition. SB 700 was signed into law by Governor Davis on September 22, 2003.

While possible approaches were explored during the ATCM development, agreement on how this issue should be treated could not be reached prior to the beginning of the 45-day public comment period. ARB staff will continue to meet with interested parties on this issue and may propose an appropriate provision at the Board hearing with interested parties that would allow the continued use of some of these engines.

**10. What are the environmental impacts of the proposed ATCM?**

The proposed ATCM will reduce diesel PM emissions and resulting exposures from stationary engines throughout California. ARB staff estimates that, with implementation of the ATCM, diesel PM emissions from stationary diesel-fueled engines used in non-agricultural operations will be reduced by approximately 80 percent or 0.9 tons per day in 2020 relative to the 2002 baseline. These reductions are due to both the implementation of the ATCM and the expected normal turnover of engines. As shown in Figure E-1, ARB staff estimates that the ATCM will result in a 50 percent reduction in diesel PM emissions from the projected uncontrolled baseline.

**Figure E-1: Projected Diesel PM Emissions with and without the ATCM**




California's air quality will also experience benefits from reduced criteria pollutant emissions (e.g., NOx, ROG). ARB staff estimates that, as older engines are replaced with new engines or retrofitted with diesel PM control devices, between 2005 and 2020, approximately 2.2 tons per day NOx and 0.3 tons per day of ROG will be removed from California's air. We anticipate significant health cost savings due to reduced mortality, incidences of cancer, PM related cardiovascular effects, chronic bronchitis, asthma, and hospital admissions for pneumonia and asthma-related conditions. These directly emitted diesel PM reductions are expected to reduce the number of premature deaths in California. ARB staff estimates that 121 premature deaths (60-185, 95 percent confidence interval (95 CI)) will be avoided by 2020. Prior to 2020, cumulatively, it is estimated that 60 premature deaths (29-90, 95 CI) would be avoided by 2010 and 97 (48-146, 95 CI) by 2015. ARB staff has concluded that no significant adverse environmental impacts should occur under the proposed ATCM.

**11. What are the economic impacts of the proposed ATCM?**

ARB staff estimates the cost of the ATCM to affected businesses and government agencies to be approximately 47 million dollars for the total capital costs. This corresponds to 8.4 million dollars annually over the useful life of the control equipment. The useful life of the control equipment depends on the number of hours the engine is expected to operate annually. For prime engines, the useful life ranges from 4 to 25 years with a 10-year average. For emergency standby engines, the expected useful life is 25 years.

The majority of the costs will be borne by prime engine owners. In many cases, owners of emergency standby engines will have no cost or net savings due to the reduced operating hours. We estimate that only a small number of emergency standby engines will need to install diesel emission controls (DECS).

Most businesses in California do not own any diesel-fueled stationary engines. For those businesses that do have engines, the cost will vary depending on the number of engines operated and the engine size, activity and operating parameters. ARB staff estimated the costs to comply with the ATCM for a typical business with a 590 horsepower prime engine. The estimated capital cost is $22,400 for the installation of a DPF. For those engines installing a DOC and then later replacing that engine with a new Tier IV engine in 2011, the estimated capital cost is $60,800. For engines with a DPF, there will be an additional annual cost of approximately $550 for maintenance.

For businesses with emergency standby engines, we expect most operators to reduce their annual hours of operation to avoid installation of DECS, which should result in cost savings due to a reduction in the annual diesel fuel usage. For example, an operator with one engine (520 hp) could reduce maintenance and testing usage from 35 to 20 hours, thereby saving about $760 annually. While most operators will likely reduce their hours of operation to meet the ATCM requirements, we estimate that about one percent of operators will need to install a DOC.

Overall, most affected businesses will be able to absorb the costs of the proposed regulation with no significant adverse impacts on their profitability. This finding is based on the staff's analysis of the estimated change in "return on owner's equity" (ROE). The analysis found that the overall change in ROE ranges from negligible to a decline of about six percent. Generally, a decline of more than ten percent in ROE suggests a significant impact on profitability. Because the proposed ATCM would not alter significantly the profitability of most businesses, we do not expect a noticeable change in employment, business creation, elimination, or expansion, and business competitiveness in California. We also found no significant adverse economic impacts on any local or State agencies.

We estimate the overall cost effectiveness of the proposed ATCM to be about $15 per pound ($/lb) of diesel PM reduced, considering only the benefits of reducing diesel PM. Because the proposed ATCM will also reduce reactive organic gases (ROG) and NOx emissions, we allocated half of the costs of compliance against these benefits, resulting in cost effectiveness values of $8/lb of diesel PM and $1/lb of ROG plus NOx reduced.

With regard to mortality benefits, we estimate the cost of avoiding one premature death to be about $216,000 based on attributing half of the cost of controls to reduce diesel PM. Compared to the U.S. EPA's present assignment of $4.4 million as the value of an avoided death, this proposed ATCM is a very cost-effective mechanism for preventing premature deaths caused by diesel PM.

## 12. How does the proposed ATCM fulfill the goals of the Diesel Risk Reduction Plan as they pertain to stationary engines?

In the Diesel Risk Reduction Plan, ARB staff recommended an ATCM for new engines be developed to reflect the ARB's permitting guidance document, Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines (September 2000). For in-use engines, ARB staff recommended retrofit controls be installed. The overall goal was to achieve the maximum feasible reduction in emissions taking into account cost and risk. Similar to other applications, the target was to achieve an 85 percent reduction in the emissions from stationary engines by 2020.

The proposed ATCM is consistent with the goals in the Diesel Risk Reduction Plan. The requirements and standards in the ATCM are based on the application of BACT for diesel PM. ARB staff estimates that with implementation of the ATCM diesel PM emissions will be reduced by approximately 0.9 tons per year in 2020 relative to the 2002 baseline. This represents about an 80 percent reduction from the 2002 baseline emissions. For new engines used in agricultural applications, BACT is defined as an engine with a 0.15 g/bhp-hr emission rate. Requirements for in-use agricultural engines are not included in the ATCM; however, as discussed earlier, ARB staff are pursuing several avenues to achieve further diesel PM emission reductions from this category. Our analysis of how to further reduce PM and NOx emission from stationary diesel engines in agricultural service will be completed by January 2005.

## 13. How does the proposed ATCM relate to ARB's goals for Environmental Justice?

Environmental Justice is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. ARB's Environmental Justice Policies are intended to promote the fair treatment of all Californians and cover the full spectrum of the ARB's activities.

The proposed ATCM is consistent with the environmental justice policy to reduce health risks from TACs in all communities, including those with low-income and minority populations, regardless of location. The ATCM will reduce diesel PM emissions from stationary CI engines by requiring the use of the best available control technologies or by reducing the hours of operation. The proposed ATCM will provide air quality benefits for all communities depending upon the number of existing emergency standby and/or prime engines currently operating in those communities.

### 14. How does the proposed ATCM affect sensitive receptors such as children and cumulative risk?

The goal of the proposed ATCM is to establish diesel PM emission standards and operating requirements for stationary engines that are based on the implementation of the best available diesel PM control technologies (BACT) and the use of the lowest-emitting diesel-fueled CI engines. The specific requirements for a given stationary diesel-fueled engine are dependant on a number of factors including, application (prime or emergency standby), hours of operation, and emission rate of the engine. In most cases, the residual cancer risk from each engine subject to the emission standards and operating requirements of the proposed ATCM is estimated to be less than 10 excess cancer cases in a million, which is consistent with the threshold risk level used by most districts when defining significant risk levels. When estimating the cancer risk to a receptor, the risk assessment methodology estimates the risk based on a lifetime of exposure (70 years), and it accounts for the periods in life when we are most susceptible to the health effects of exposure to diesel PM – both early and late in life. To further reduce children's exposure to diesel PM, the ATCM prohibits schools from operating stationary diesel engines, except for emergencies, when school activities are taking place.

Cumulative risk in this case refers to the cancer risk posed by more than one stationary diesel-fueled engine operating at the same facility or in the same general area. The proposed ATCM will reduce cumulative risk since it will require individual engines to implement BACT. However, ARB staff recognizes that there may be specific situations where the cumulative risk from engines located in close proximity of one another may be elevated, even after the proposed ATCM is fully implemented. Since these are site-specific situations, depending on many factors, the ATCM provides the Districts the authority to establish more stringent diesel PM emission standards and operating requirements on a site-specific basis. In addition to the requirements of the proposed ATCM, the Air Toxics "Hot Spots" program will also be used to determine if there is a need to reduce the cumulative risk from more than one stationary diesel-fueled engine operating at the same facility. The "Hot Spots" program will require facilities to evaluate the cumulative risks from engines at their facility and require additional reductions in diesel PM emissions to reduce excessive risks.

## 15. How are the AB 2588 "Hot Spots" requirements and the ATCM interrelated?

ARB staff is currently developing amendments to the Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines Regulation to address diesel engines. These amendments are being developed to align with the ATCM requirements with the goal of avoiding duplicative requirements and ensuring that potential risks from all engines are evaluated and mitigated where necessary. As currently envisioned, ARB staff believes that the initial reporting requirement in the ATCM will also fulfill the emission inventory requirement of "Hot Spots." In some cases, compliance with the ATCM will fulfill all requirements under "Hot Spots." For example, for owners of a single emergency standby diesel engine at a facility currently not in the "Hot Spots" program, compliance with the ATCM will also reduce the potential risk from that engine to below 10 in a million. For these engines, compliance with the ATCM will also fulfill the "Hot Spots" requirements provided the district has a 10 in a million significance level.

The proposed amendments to the "Hot Spots" Emission Inventory Criteria and Guidelines Regulation are tentatively scheduled to be considered by the Board at its December 2003 hearing. ARB staff expects to conduct additional workshops this fall to further define the necessary modifications to the regulation.

## 16. What future activities are planned?

After Board consideration and approval of the proposed ATCM, ARB staff will work on a number of projects related to the implementation of the proposed ATCM, the collection and processing of engine-related data, and the improvement of the stationary diesel-fueled engine emission inventory. Specifically, resources will be devoted to the following:

- Working with districts to implement the requirements of the ATCM

  After adoption, each district is required to either implement and enforce the ATCM or adopt its own rule that is as effective or more effective overall. ARB staff will work with each district to ensure these requirements are being met and will develop implementation guidance as appropriate.

- Monitoring implementation

  ARB staff will monitor implementation of the proposed ATCM. This will include monitoring advancements in emission control technologies and evaluating BACT. In the event implementation reveals amendments to the ATCM are warranted or that BACT has changed, ARB staff will propose amendments for the Board's consideration.

- Monitoring the availability of retrofit devices for agricultural applications and high-use emergency standby engines

ARB staff will follow the development of retrofit technologies applicable to agricultural engines and high-use emergency standby engines. In the event technically feasible and cost-effective retrofit controls become available, we will propose amendments to the ATCM.

- Evaluating the feasibility of replacing agricultural diesel-fueled irrigation pumps with electrically driven pumps

  Significant environmental benefits could be realized from the replacement of diesel-fueled irrigation pumps with electrically driven pumps. Over the next several months, ARB staff intends to work with California's agricultural interests and other parties determine if such a transition could be a cost-effectiveness option that should be incorporated into the ATCM.

- Evaluating in-use experience with proposed test methods

  Because the proposed ATCM incorporates a new field method for stationary diesel-fueled engines, ARB staff will monitor application of the test method, work with the districts to develop appropriate in-use compliance testing protocols, and develop any necessary guidance for use of the testing results in health risk assessments.

- Integration of "Hot Spots" and the ATCM

  As stated previously, ARB staff will develop amendments to the *"Hot Spots" Emission Inventory Criteria and Guidelines Regulation* to address diesel PM with the goals of avoiding duplicative requirements and ensuring that potential risks from all engines are evaluated and mitigated as necessary. In addition, ARB staff also intends to determine if the risk assessment procedures can be streamlined by developing more simplified estimation methods that could be used in lieu of air dispersion modeling. Any simplified methodology would be incorporated into guidance for the "Hot Spots" evaluation and ARB guidance on conducting health risk assessments for stationary diesel-fueled engines.

- Updating inventory with the reporting data

  A key requirement of the ATCM is the initial reporting of information on the number of engines and their operating characteristics. This information will be used to update the ARB's emission inventory for stationary engines and will also be incorporated into the Community Health Air pollution Information System (CHAPIS), which will be made available to the public in the coming months. CHAPIS is a new web-based mapping tool that will provide maps of air pollution emission sources over the Internet.

## 17. What is staff's recommendation?

We recommend the Board approve the proposed ATCM presented in this report (Appendix A). The ATCM will reduce diesel PM emissions from new and in-use stationary CI engines by requiring the use of the best available control technologies or by reducing the hours of operation. The proposed ATCM will provide air quality benefits for all communities depending upon the number of existing emergency standby and/or prime engines currently operating in those communities. ARB staff believes the proposed ATCM is technologically feasible and necessary to carry out the Board's responsibilities under State law.

# I. INTRODUCTION

In this chapter, the Air Resources Board (ARB or Board) staff provides an overview of the Staff Report, discusses the purpose of the ATCM, and discusses the regulatory authority the ARB has to adopt the ATCM.

## A. Overview

This report presents the proposed Airborne Toxics Control Measure to reduce the emissions of diesel particulate matter (diesel PM) from stationary diesel-fueled compression ignition engines (stationary diesel-fueled engines). A detailed summary of the requirements of the proposed ATCM is found in Chapter V. The report also shares the information that ARB staff used in developing the proposed ATCM. This information includes:

- the health effects associated with exposure to diesel PM emissions (Chapter II);
- the requirements of current regulations that are designed to reduce emissions from stationary compression ignition engines (Chapter III);
- the diesel PM emission inventory and health risks posed by stationary diesel-fueled engines (Chapter IV);
- a discussion of the technical feasibility of the control technologies that can be used to comply with the emission standards defined in the proposed ATCM (Chapter VI),
- a discussion of the regulatory alternatives to the proposed ATCM and why they were not chosen (Chapter VII);
- the environmental impacts of implementing the proposed ATCM (Chapter VIII); and
- the economic impacts of the proposed ATCM (Chapter IX).

In developing the proposed ATCM, there were a number of technical and policy issues that had to be addressed. These included defining a test method for stationary diesel-fueled engines and integrating the requirements of the proposed ATCM with the AB 2588 "Hot Spots" Program. These and other key issues are discussed in Chapter X, Additional Considerations.

The text of the proposed ATCM and other supporting information are found in the Appendices.

## B. Purpose

The primary purpose of the proposed ATCM is to reduce the general public's exposure to diesel PM from stationary diesel-fueled engines. The proposed ATCM establishes requirements that fall in four major categories: fuel use requirements; emission standards; operational requirements; and recordkeeping, reporting, and monitoring requirements.

The purpose of the fuel use requirements is to ensure that only the cleanest available diesel or alternative diesel fuels are used in stationary diesel-fueled engines. The purpose of the stringent diesel PM emission standards are to ensure that the sellers and owner/operators of both new and in-use stationary diesel-fueled engines are implementing the best available diesel PM control strategies. The purpose of the operational requirements is to ensure that owners/operators of both new and in-use stationary diesel-fueled engines reduce overall emissions and concurrently operate only when essential, thereby limiting the near-source risk associated with exposure to diesel PM to the maximum extent possible. An example of an operational requirement is the limit placed on the number of hours an owner of an emergency standby engine can run an engine for maintenance and testing purposes. Finally, the purpose of the recordkeeping, reporting, and monitoring requirements is to provide both the district and the ARB staff with information on where stationary diesel-fueled engines are located, how they are used, and what strategies sellers, owners, and operators are using to comply with the requirements of the proposed ATCM. Chapter V of this Staff Report contains a plain English discussion of the key requirements of the proposed ATCM, and Appendix A contains the full text of the proposed ATCM.

## C. Regulatory Authority

Several sections of the California Health and Safety Code (H&SC) provide the ARB with authority to adopt the proposed ATCM. Sections 39600 (General Powers) and 39601 (Standards, Definitions, Rules, and Measures) of the H&SC confer to the ARB the general authority and obligation to adopt rules and measures necessary to execute the Board's powers and duties imposed by State law.

More specifically, California's Air Toxics Program, established under California law by AB 1807 (Stats. 1983, Ch. 1047) and set forth in Health and Safety Code sections 39650 through 39675, mandates the identification and control of TACs in California. The identification phase of the Air Toxics Program requires the ARB, with participation of other state agencies such as the Office of Environmental Health Hazard Assessment (OEHHA), to evaluate the health impacts of and exposure to substances and to identify those substances that pose the greatest health threat as TACs. The ARB's evaluation is made available to the public and is formally reviewed by the Scientific Review Panel (SRP) established under Health and Safety Code section 39670. Following the ARB's evaluation and the SRP's review, the Board may formally identify a TAC at a public hearing. Following the identification of a substance as a TAC, Health and Safety Code sections 39658 and 39665 requires the ARB, with the participation of the air pollution control and air quality management districts, and in consultation with affected sources and interested parties, to prepare a report on the need and appropriate degree of regulation for that substance (risk management phase).

In August 1998, the Board identified diesel PM as a TAC, and in September 2000, the ARB adopted the "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-fueled Engines and Vehicles" (Diesel Risk Reduction Plan). (ARB, 2000) The Diesel Risk Reduction Plan was the first formal product of the risk management phase and serves as the needs assessment under the AB1807 process. In the Diesel Risk Reduction Plan, the ARB indentified the available options to reduce diesel PM and the recommended control measures to achieve reductions, including a measure to reduce diesel PM from stationary diesel-fueled engines.

In 1999, California's Air Toxics Program was amended by Senate Bill 25 (Stats. 1999, Ch. 731) to provide additional requirements for further consideration of health impacts to infants and children. As part of these requirements, the OEHHA was to identify up to five TACs as making children especially susceptible to illness. The OEHHA published the "Prioritization of Toxic Air Contaminants under the Children's Environmental Health Protection Act" in October 2001, identifying diesel PM as one of the five TACs. Additional requirements established by Senate Bill 25 in Health and Safety Code section 39669.5 directs the ARB to adopt control measures, as appropriate, to protect public health, particularly infants and children, from these specially identified TACs.

This ATCM is being proposed to fulfill the goals of the Diesel Risk Reduction Plan and to comply with the requirements of H&SC section 39666 and 39669.5 to prevent an endangerment to public health. To control criteria pollutant emissions, H&SC section 43013(b) directs the ARB to adopt standards and regulations for non-vehicle engines, which covers stationary diesel-fueled engines.

## D. Public Outreach and Environmental Justice

### Environmental Justice

The ARB is committed to integrating environmental justice in all of its activities. On December 13, 2001, the Board approved "Policies and Actions for Environmental Justice," which formally established a framework for incorporating Environmental Justice into the ARB's programs, consistent with the directive of California state law. (ARB, 2001) Environmental Justice is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. These policies apply to all communities in California, but recognize that environmental justice issues have been raised more in the context of low-income and minority communities.

The Environmental Justice Polices are intended to promote the fair treatment of all Californians and cover the full spectrum of the ARB's activities. Underlying these Policies is a recognition that the agency needs to engage community members in a meaningful way as it carries out its activities. People should have the best possible information about the air they breathe and what is being done to reduce unhealthful air pollution in their communities. The ARB recognizes its obligation to work closely with all communities, environmental and public health organizations, industry, business owners, other agencies, and all other interested parties to successfully implement these Policies.

During the development process, the ARB staff proactively searched for opportunities to present information about the proposed ATCM at places and times convenient to stakeholders. For example, the meetings were held at times and locations that encouraged public participation, including evening sessions. Attendees included representatives from environmental organizations, military, communication companies and service providers, engine and diesel emission control associations, and other parties interested in prime or emergency standby stationary diesel-fueled engines. These individuals participated both by providing data and reviewing draft regulations and by participating in open forum workshops, in which staff directly addressed their concerns. Table I-1 below provides meeting dates that were made to apprise the public about the development of the proposed ATCM.

The proposed ATCM is consistent with the environmental justice policy to reduce health risks from TACs in all communities, including those with low-income and minority populations, regardless of location. The ATCM will reduce diesel PM emissions from all stationary diesel-fueled engines by requiring the use of the best available control technologies or by reducing the hours of operation. The proposed ATCM will provide air quality benefits for all communities depending upon the number of existing emergency standby and/or prime engines currently operating in those communities.

Outreach Efforts

Since the identification of diesel PM as a TAC in 1998, the public has been more aware of the health risks posed by the emissions of this TAC. At many of the ARB's community outreach meetings over the past few years, the public has raised questions regarding our efforts to reduce exposure to diesel PM. At these meetings, ARB staff told the public about the Diesel Risk Reduction Plan adopted in 2000 and described some of the measures in that plan, including those for stationary diesel-fueled engines.

The ARB has held 8 public workshops and 2 community outreach meetings since 2001 in developing this rule (see Table I-1). Over 700 individuals and/or companies were notified for each workshop through a series of mailings. Notices were posted to ARB's diesel risk reduction and public workshops web sites and e-mailed to subscribers of the stationary diesel risk reduction electronic list server. For the last six workshops, live audio broadcasts were also available to the public via the Internet. For the community outreach meetings, notices were send to individuals on our Neighborhood Assessment Program mailing lists.

**Table I-1: Workshop/Outreach Meeting Locations and Times**

| Date | Meeting | Location | Time |
|---|---|---|---|
| February, 14 2001 | Public Workshop | Cal/EPA Building, Sacramento | 9:30 a.m. |
| January, 16, 2002 | Public Workshop | Cal/EPA Building, Sacramento | 9:30 a.m. |
| April, 4 2002 | Public Workshop | Cal/EPA Building, Sacramento | 9:30 a.m. |
| September 4, 2002 | Public Workshop | Cal/EPA Building, Sacramento | 9:30 a.m. |
| November 19, 2002 | Public Workshop | Cal/EPA Building, Sacramento | 9:30 a.m. |
| March 6, 2003 | Public Workshop | Cal/EPA Building, Sacramento | 9:30 a.m. |
| April 1, 2003 | Community Outreach | Hollenbeck Middle School, Boyle Heights (ATCM Overview) | 6:00 p.m. |
| April 30, 2003 | Community Outreach | Wilmington Park Elementary School, Wilmington (ATCM Overview) | 6:00 p.m. |
| June 5, 2003 | Public Workshop | Cal/EPA Building, Sacramento | 9:30 a.m. |
| August 26, 2003 | Public Workshop | Cal/EPA Building, Sacramento | 9:30 a.m. |

In addition to the public workshops or community outreach meetings presented in Table I-1, ARB staff and management participated in numerous industry and government agency meetings over the past three years, presenting information on the Diesel Risk Reduction Plan and our proposed regulatory approach for stationary diesel-fueled engines. Some of the industry groups and environmental associations participating were the California Council for Economic and Environmental Balance, Association of California Water Agencies, Construction Materials Association of California, American Lung Association, Engine Manufacturers Association, Manufacturers of Emission Controls Association, Southern California Alliance of Publicly Owned Treatment Works, California Ski Industry Association, National Resources Defense Counsel, Environmental Defense, the United States Navy, California Healthcare Association, California Army National Guard, University of California Office of the President, agricultural community interests, and several publicly treated wastewater facilities. Several state agencies, including the Department of General Services, California Youth Authority, Department of Water Resources, and the California Department of Corrections were contacted and invited to meet with ARB staff to discuss the propose ATCM and how it relates to their agencies. Staff also participated in bi-monthly and sometimes monthly meetings of the California Air Pollution Control Officers Association (CAPCOA) and CAPCOA Engineering Managers, where current status reports were given on the progress of the proposed regulation, and feedback from CAPCOA was incorporated into the draft ATCM.

In February and March 2001, staff held eight public consultation meetings with the agricultural community to initiate dialogue on the implementation of the Diesel Risk Reduction Plan. Members of California's Farm Bureaus, the Nisei Farmers League, and other agricultural organizations were invited to attend. In addition, an agriculture working group was formed to provide a forum for discussing issues with the proposed ATCM unique to the agriculture industry. The working group met several times during 2002 and 2003 and provided valuable assistance in developing the ATCM as it relates to California's agricultural activities.

As a way of inviting public participation and enhancing the information flow between the ARB and interested parties, staff created a diesel risk reduction program Internet web site (http://www.arb.ca.gov/diesel/dieselrrp.htm) in December 2000. Since that time, staff has consistently made available on the web site all related documents, including meeting presentations and draft versions of the proposed regulatory language. The web site has also provided background information on diesel PM, fact sheets, workshop and meeting notices and materials, and other diesel related information, and has served as a portal to other web sites with related information.

Outreach efforts have also included hundreds of personal contacts via telephone, electronic mail, regular mail, surveys, facility visits, and individual meetings with interested parties. These contacts have included interactions with engine manufacturers and operators, emission control system manufacturers, local, national, and international trade association representatives, environmental, pollution prevention, and public health organizations, State agencies, military officials and representatives, and other federal agencies.

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## II. NEED FOR CONTROL OF DIESEL PARTICULATE MATTER

In 1998, the Air Resources Board identified diesel particulate matter (diesel PM) as a TAC. Diesel PM is by far the most important TAC and contributes over 70 percent of the estimated risk from air texics today. In September 2000, the ARB approved the "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles" (Diesel Risk Reduction Plan). The goal of the Diesel Risk Reduction Plan is to reduce diesel PM emissions and the associated cancer risk by 85 percent in 2020. In addition, in 2001, the Office of Environmental Health Hazard Assessment identified diesel PM as one of the TACs that may cause children or infants to be more susceptible to illness pursuant to the requirements of Senate Bill 25 (Stats. 1999, ch. 731). Senate Bill 25 also requires the ARB to adopt control measures, as appropriate, to reduce the public's exposure to these special TACs (H&SC section 39669.5).

This proposed ATCM, to reduce diesel PM emissions from stationary diesel-fueled engines, is one of a large group of regulations being developed to achieve the emission reduction goals of the Diesel Risk Reduction Plan of protecting the health of Californians by reducing the public's exposure to diesel PM. The proposed ATCM will also reduce emissions of ROG and oxides of nitrogen (NOx), precursors to the formation of ozone.

This chapter describes the physical and chemical characteristics of diesel PM and discusses the health effects of the pollutants emitted by diesel engines and environmental benefits from the proposed regulation. As discussed below, it is important that steps be taken to reduce emissions from all diesel-fueled engines, including stationary diesel-fueled engines, to reduce public exposures to diesel PM and ozone, further progress in meeting the ambient air quality standards, and to improve visibility.

### A. Physical and Chemical Characteristics of Diesel PM

Diesel engines emit a complex mixture of inorganic and organic compounds that exist in gaseous, liquid, and solid phases. The composition of this mixture will vary depending on engine type, operating conditions, fuel, lubricating oil, and whether or not an emission control system is present. The primary gas or vapor phase components include typical combustion gases and vapors such as carbon monoxide (CO), carbon dioxide ($CO_2$), sulfur dioxide ($CO_2$), oxides of nitrogen (NOx), reactive organic gases (ROG), water vapor, and excess air (nitrogen and oxygen). For example, an uncontrolled 1988 500hp diesel engine could have a PM emission rate of over 0.5 g/bhp-hr, whereas a 2003 model year engine is required to meet a 0.15 g/bhp-hr emission rate and, under the proposed Tier 4 standards, that same size engine will be required to meet a 0.01 g/bhp-hr emission rate in the 2011-2014 timeframe.

The emissions from diesel-fueled engines also contain potential cancer-causing substances such as arsenic, nickel, benzene, formaldehyde, and polycyclic aromatic hydrocarbons (PAHs). There are over 40 substances that are listed by the U.S. EPA as hazardous air pollutants and by the ARB as TACs in emissions from diesel-fueled engines. Fifteen of these substances are listed by the International Agency for Research on Cancer as carcinogenic to humans, or as a probable or possible human carcinogen. The list includes the following substances: formaldehyde, acetaldehyde, 1,3-butadiene, antimony compounds, arsenic, benzene, beryllium compounds, inorganic lead, mercury compounds, bis(2-ethylhexyl)phthalate, dioxins and dibenzofurans, nickel, POM (including PAHs); and styrene.

Diesel PM is either directly emitted from diesel-powered engines (primary particulate matter) or is formed from the gaseous compounds emitted by a diesel engine (secondary particulate matter). Diesel PM consists of both solid and liquid material and can be divided into three primary constituents: the elemental carbon fraction; the soluble organic fraction, and the sulfate fraction.

Many of the diesel particles exist in the atmosphere as a carbon core with a coating of organic carbon compounds, or as sulfuric acid and ash, sulfuric acid aerosols, or sulfate particles associated with organic carbon. (Beeson, 1998) The organic fraction of the diesel particle contains compounds such as aldehydes, alkanes and alkenes, and high-molecular weight PAH and PAH-derivatives. Many of these PAHs and PAH-derivatives, especially nitro-PAHs, have been found to be potent mutagens and carcinogens. Nitro-PAH compounds can also be formed during transport through the atmosphere by reactions of adsorbed PAH with nitric acid and by gas-phase radical-initiated reactions in the presence of oxides of nitrogen. Fine particles may also be formed secondarily from gaseous precursors such as SO2, NOx, or organic compounds. Fine particles can remain in the atmosphere for days to weeks and travel through the atmosphere for hundreds to thousands of kilometers, while coarse particles deposit to the earth within *minutes to hours and within tens of kilometers from the emission source.*

Almost all of the diesel particle mass is in the fine particle range of 10 microns or less in diameter ($PM_{10}$). Approximately 94 percent of the mass of these particles are less than 2.5 microns ($PM_{2.5}$) in diameter. Diesel PM can be distinguished from noncombustion sources of $PM_{2.5}$ by the high content of elemental carbon with the adsorbed organic compounds and the high number of ultrafine particles (organic carbon and sulfate).

The soluble organic fraction (SOF) consists of unburned organic compounds in the small fraction of the fuel and atomized and evaporated lube oil that escape oxidation. These compounds condense into liquid droplets or are adsorbed onto the surfaces of the elemental carbon particles. Several components of the SOF have been identified as individual TACs.

## B. Health Impacts of Exposure to Diesel PM, Ambient Particulate Matter, and Ozone

The proposed ATCM will reduce the public's exposure to diesel PM as well as reduce ambient particulate matter. In addition, the proposed ATCM is expected to result in reductions in emissions of NOx and ROG, which are precursors to the formation of ozone in the lower atmosphere. The primary health impacts of these air pollutants are discussed below.

Diesel Particulate Matter

Diesel PM is of specific concern because it poses a lung cancer hazard for humans as well as a hazard from noncancer respiratory effects such as pulmonary inflammation. (ARB, 1998a) Because of their small size, the particles are readily respirable and can effectively reach the lowest airways of the lung along with the adsorbed compounds, many of which are known or suspected mutagens and carcinogens. (ARB, 2002) More than 30 human epidemiological studies have investigated the potential carcinogenicity of diesel PM. On average, these studies found that long-term occupational exposures to diesel exhaust were associated with a 40 percent increase in the relative risk of lung cancer. (ARB, 1998b) However, there is limited specific information that addresses the variable susceptibilities to the carcinogenicity of diesel exhaust within the general human population and vulnerable subgroups, such as infants and children and people with preexisting health conditions. The carcinogenic potential of diesel exhaust was also demonstrated in numerous genotoxic and mutagenic studies on some of the organic compounds typically detected in diesel exhaust. (ARB, 1998b)

Diesel PM was listed as a TAC by ARB in 1998 after an extensive review and evaluation of the scientific literature by OEHHA. (ARB 1998c) Using the cancer unit risk factor developed by OEHHA for the TAC program, it was estimated that for the year 2000, exposure to ambient concentrations of diesel (1.8 $\mu g/m^3$) could be associated with a health risk of 540 potential cancer cases per million people exposed over a 70-year lifetime.

Another highly significant health effect of diesel exhaust exposure is its apparent ability to act as an adjuvant in allergic responses and possibly asthma. (Dab, 2000) (Diaz-Sanchez, 1996) (Kittelson, 1999) However, additional research is needed at diesel exhaust concentrations that more closely approximate current ambient levels before the role of diesel PM exposure in the increasing allergy and asthma rates is established.

Ambient Particulate Matter

The key health effects categories associated with ambient particulate matter, of which diesel PM is a component, include premature mortality; aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions and emergency room visits, school absences, work loss days, and restricted activity days); aggravated asthma; acute respiratory symptoms, including aggravated coughing and difficult or painful breathing, chronic bronchitis, and decreased lung function that can be experienced as shortness of breath. (U.S. EPA 2000, U.S. EPA 2003)

Health impacts from exposure to the fine particulate matter ($PM_{2.5}$) component of diesel exhaust have been calculated for California, using concentration-response equations from several epidemiological studies. Both mortality and morbidity effects could be associated with exposure to either direct diesel $PM_{2.5}$ or indirect diesel $PM_{2.5}$, the latter of which arises from the conversion of diesel $NO_x$ emissions to $PM_{2.5}$ nitrates. It was estimated that 2000 and 900 premature deaths resulted from long-term exposure to either 1.8 $\mu g/m^3$ of direct $PM_{2.5}$ or 0.81 $\mu g/m^3$ of indirect $PM_{2.5}$, respectively, for the year 2000. (Lloyd, 2001) The mortality estimates are likely to exclude cancer cases, but may include some premature deaths due to cancer, because the epidemiological studies did not identify the cause of death. Exposure to fine particulate matter, including diesel $PM_{2.5}$ can also be linked to a number of heart and lung diseases.

<u>Ozone</u>

Diesel exhaust consists of hundreds of gas-phase, particle-phase, and semi-volatile organic compounds, including typical combustion products, such as $CO_2$, hydrogen, oxygen, and water vapor, as well as CO, ROG, carbonyls, alkenes, aromatic hydrocarbons, PAHs, PAH derivatives, and sulfur oxides (SOx) - compounds resulting from incomplete combustion. Ozone is formed by the reaction of ROG and NOx in the atmosphere in the presence of heat and sunlight. The highest levels of ozone are produced when both ROG and NOx emissions are present in significant quantities on clear summer days. This pollutant is a powerful oxidant that can damage the respiratory tract, causing inflammation and irritation, which can result in breathing difficulties.

Studies have shown that there are impacts on public health and welfare from ozone at moderate levels that do not exceed the 1-hour ozone standard. Short-term exposure to high ambient ozone concentrations have been linked to increased hospital admissions and emergency visits for respiratory problems. (Peters, 2001) Repeated exposure to ozone can make people more susceptible to respiratory infection and lung inflammation and can aggravate preexisting respiratory diseases, such as asthma. Prolonged (six to eight hours), repeated exposure to ozone can cause inflammation of the lung, impairment of lung defense mechanisms, and possibly irreversible changes in lung structure, which over time could lead to premature aging of the lungs and/or chronic respiratory illnesses such as emphysema and chronic bronchitis.

The subgroups most susceptible to ozone health effects include individuals exercising outdoors, children and people with preexisting lung disease such as asthma, and chronic pulmonary lung disease. Children are more at risk from ozone exposure because they typically are active outside, during the summer when ozone levels are highest. Also, children are more at risk than adults from ozone exposure because their respiratory systems are still developing. Adults who are outdoors and moderately active during the summer months, such as construction workers and other outdoor workers, also are among those most at risk. These individuals, as well as people with respiratory illnesses such as asthma, especially asthmatic children, can experience reduced lung function and increased respiratory symptoms, such as chest pain and cough, when exposed to relatively low ozone levels during prolonged periods of moderate exertion.

## C. Health and Environmental Benefits from the Proposed Regulation

Reducing diesel PM emissions from stationary diesel-fueled engines will have both public health and environmental benefits. The proposed ATCM will reduce localized potential cancer risks associated with stationary diesel-fueled engines that are near receptors and will contribute to the reduction of the general exposure to diesel PM that occurs on a region-wide basis due to collective emissions from diesel-fueled engines. Additional benefits associated with the proposed regulation include further progress in meeting the ambient air quality standards for $PM_{10}$, PM $_{2.5}$, and ozone, and enhancing visibility.

Reduced Diesel PM Emissions

The estimated reductions in diesel PM emissions and the associated benefits from *reduced exposure and risk are discussed in detail in Chapter VIII.*

Reduced Ambient Particulate Matter Levels

Reducing diesel PM will also help efforts to achieve the ambient air quality standards for particulate matter. Both the State of California and the U.S. EPA have established standards for the amount of $PM_{10}$ in the ambient air. These standards define the maximum amount of PM that can be present in outdoor air. California's $PM_{10}$ standards were first established in 1982 and updated June 20, 2002. It is more protective of human health than the corresponding national standard. Additional California and federal standards were established for $PM_{2.5}$ to further protect public health (Table II-1).

**Table II-1: State and National PM Standards**

| California Standard | | National Standard | |
|---|---|---|---|
| **$PM_{10}$** | | | |
| Annual Arithmetic Mean | 20 µg/m$^3$ | Annual Arithmetic Mean | 50 µg/m$^3$ |
| 24-Hour Average | 50 µg/m$^3$ | 24-Hour Average | 150 µg/m$^3$ |
| **$PM_{2.5}$** | | | |
| Annual Arithmetic Mean | 12 µg/m$^3$ | Annual Arithmetic Mean | 15 µg/m$^3$ |
| 24-Hour Average | No separate State standard | 24-Hour Average | 65 µg/m$^3$ |

Particulate matter levels in most areas of California exceed one or more of current state PM standards. The majority of California is designated as non-attainment for the State $PM_{10}$ standard (ARB 2002). Diesel PM emission reductions from diesel-fueled engines will help protect public health and assist in furthering progress in meeting the ambient air quality standards for both $PM_{10}$ and PM $_{2.5}$.

*The emission reductions obtained with low sulfur diesel and diesel engines equipped* with aftertreatment systems will result in lower ambient particulate matter levels and significant reductions of exposure to primary and secondary diesel PM. Lower ambient particulate matter levels and reduced exposure mean reduction of the prevalence of the diseases attributed to diesel PM, reduced incidences of hospitalizations and prevention of premature deaths.

Reduced Ambient Ozone Levels

Emissions of NOx and ROG, precursors to the formation of ozone in the lower atmosphere, will also be reduced by the proposed regulation. In California, most major urban areas and many rural areas continue to be non-attainment for the State and federal 1-hour ambient air quality standard for ozone. Controlling emissions of ozone precursors would reduce the prevalence of the types of respiratory problems associated with ozone exposure and would reduce hospital admissions and emergency visits for respiratory problems. Ozone can also have adverse health impacts at concentrations that do not exceed the 1-hour NAAQS.

**Table II-2: State and National Ozone Standards**

| | California Standard | National Standard |
|---|---|---|
| 1 hour | 0.09 ppm (180 $\mu g/m^3$) | 0.12 ppm (235 $\mu g/m^3$) |
| 8 hour | - | 0.08 ppm (157 $\mu g/m^3$) |

Improved Visibility

In addition to the public health effects of fine particulate pollution, inhalable particulates including sulfates, nitrates, organics, soot, and soil dust contribute to regional haze that impairs visibility.

In 1999, the U.S. EPA promulgated a regional haze regulation that calls for states to establish goals and emission reduction strategies for improving visibility in 156 mandatory Class I national parks and wilderness. California has 29 of these national parks and wilderness areas, including Yosemite, Redwood, and Joshua Tree National Parks. Reducing diesel PM from stationary diesel-fueled engines will help improve visibility in these Class I areas.

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# III. STATIONARY COMPRESSION-IGNITION ENGINES: DEFINITIONS, USES, AND CURRENT REGULATIONS

## A. Definitions and Uses

A compression-ignition engine is defined as any internal combustion, diesel-cycle engine. It is generally assumed that the engine will be using diesel fuel. However, compression ignition engines can also use alternative fuels (e.g., jet fuel, biodiesel, CNG, and diesel/water mixtures).

Stationary engines are generally those that remain in one location at a facility for 12 months or longer. The engines can be divided into two categories: emergency standby engines and prime engines, both of which are used in agricultural and non-agricultural applications.

*Emergency Standby Engines*: The most common use of an emergency standby engine is in conjunction with a generator set to provide back-up electrical power during emergencies or unscheduled power outages. Emergency generator engines can range from less than 50 horsepower to over 6,000 horsepower, depending on the end users' needs. Emergency standby engines are also used with fire pumps as part of fire suppression systems. Engines used in fire pump applications are seldom larger than 200 horsepower. Since emergency standby engines are used primarily for emergency situations, their use is generally limited and most hours of operation occur for the purposes of maintenance and testing to ensure the engines are operable when needed in an emergency. Most air districts in California limit the number of hours that an emergency standby engine can be used for non-emergency purposes to between 50 and 200 hours per year. Emergency standby engines represent the majority of all stationary engines (approximately 75 percent). There are over 19,000 diesel-fueled emergency standby engines in use in California. The engines are owned and operated by various facilities and businesses, including, but not limited to, hospitals, hotels, banks, office buildings, correctional facilities, airports, retail shopping centers, factories, military installations, schools, waste and water treatment facilities, and many other types of public agencies. The vast majority of emergency standby engines are diesel-fueled. Diesel engines provide reliable service, are easy to maintain, can easily have dedicated fuel supplies, and are required where failure of an emergency power supply is critical to human life and safety.

*Prime Engines*: Prime engines are used in a wide variety of applications, including compressors, cranes, generators, pumps (including agricultural irrigation pumps), and grinders/screening units. The engines are owned and operated by various facilities and businesses including recycling plants, ports, waste and recycling facilities, military installations, electrical generating companies in remote areas that are removed from the grid, and some public agencies. The size and operation of prime engines are highly variable, depending on the specific application. Prime engines can range in size from about 50 horsepower for an engine used with a screening plant used to sort wood waste, to 2,000 horsepower or more for an engine generator set that is the main source of power for a facility. Annual operation can be as low as 100 hours a year for a prime engine driving a compressor to several thousand hours a year for an irrigation pump. There are approximately 1,300 diesel-fueled prime engines currently in use in California in non-agricultural applications.

Agricultural stationary engines are also categorized as prime engines and are used for growing and harvesting crops or raising fowl or animals for the primary purpose of making a profit, providing a livelihood, or conducting agricultural research or instruction by an educational institution. Agricultural operations do not include activities involving the processing or distribution of crops or fowl. There are approximately 5,000 stationary agricultural irrigation pump engines in California. Of the prime engines operating throughout the State, about 80 percent are agricultural irrigation pump engines.

## B. Summary of Existing Regulations and Programs

This section discusses the air pollution control laws that apply to stationary diesel-fueled engines. Health and Safety Code Division 26, Section 40000 specifies that the ARB has direct responsibility for controlling emissions from motor vehicles, and that districts have the responsibility of controlling air pollution from all sources other than motor vehicles.

### New Source Review Rules

A new or modified stationary diesel-fueled engine may be subject to one or more federal, State or local air pollution control laws. The federal Clean Air Act established two distinct preconstruction permit programs (termed New Source Review (NSR)) governing the construction of major new and modifying stationary sources. NSR is intended to ensure these sources do not prevent the attainment or interfere with the maintenance of the ambient air quality standards. Sources constructing in nonattainment areas are required to apply the Lowest Achievable Emission Rate (LAER) control technology to minimize emissions and to "offset" the remaining emissions with reductions from other sources. Sources constructing in attainment or unclassified areas are required by the Prevention of Significant Deterioration (PSD) program to apply the Best Available Control Technology (BACT) and meet additional requirements aimed at maintaining the region's clean air. In addition, the Federal Clean Air Act requires all major sources subject to federal NSR to obtain federal Title V operating permits governing continuing operations.

The Health and Safety Code requires districts with nonattainment areas for CO, NOx, ozone, and SOx to design permit programs for new and modified stationary sources with the potential to emit above specified levels to achieve no net increase in emissions. In these areas, districts must also require BACT on new and modified stationary sources above specified emission levels.

The Health and Safety Code allows local districts to establish a permit system that requires any person who builds, erects, alters, replaces or operates equipment or machinery which may cause the issuance of air contaminants to obtain a permit from the district. All districts in California have adopted permit programs. Generally, the local districts incorporate the State and federal permitting requirements into their preconstruction and operating permit programs. Some districts issue separate federal permits. Most of the emission control requirements that have been established for diesel-fueled engines have been set through the district permitting programs. In addition, for particulate matter, nothing restricts the authority of a district to adopt regulations to control suspended particulate matter or visibility reducing particles.

IC Engine Regulations

While most districts require some level of control to reduce NOx emissions from new and modified stationary and portable diesel-fueled engines, only 12 districts have adopted source-specific regulations affecting emissions from existing stationary and portable diesel-fueled engines. Engines used in agricultural operations, emergency standby applications, and low capacity engines are typically exempt from these regulations. All 12 regulations set NOx and carbon monoxide (CO) standards (three districts also have hydrocarbon (HC) standards). These regulations do not set standards for diesel PM emissions. However, South Coast Air Quality Management District (SCAQMD) Regulation 1110.2 is projected by SCAQMD staff to result in a number of diesel-fueled engines being taken out of service because of the cost of satisfying the regulation's NOx standard. Consequently, SCAQMD staff expects overall diesel PM emissions will be lower in the SCAQMD by the end of 2004.

Emergency Standby Requirements

In addition to local district regulation of emergency standby engines, there are other laws and regulations that affect the use of these engines. Certain types of facilities are required by either California law or local regulations to provide for emergency lighting and power. Examples of affected facilities include medical facilities, prisons, and certain office complexes. For medical facilities, State law requires that the equipment providing the emergency lighting and power must be tested at load for 30 minutes every 7 to 10 days.[5]

Toxic New Source Review

Currently, at least eight districts have adopted Toxic New Source Review rules, and many more districts have policies. A rule is a set of criteria that has been formally adopted. A policy is a set of guiding principles that has not been codified into a rule. These rules or policies were generally not specifically designed for permitting diesel-fueled engines. Most of these rules and policies use an approach that incorporates risk levels that trigger the installation of Toxic Best Available Control Technology (T-BACT) and permit denial.

[5] An Assembly Bill (AB 390) was considered by the State Legislature in the 2003/2004 session and was enrolled on August 28, 2003. If enacted, it would reduce the required testing frequency for emergency standby diesel-fueled generators operated by health facilities.

Diesel Risk Management Guidance

The *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines, September 2000,* (Guidance) provides assistance to local air pollution control districts and air quality management districts (districts) in making risk management decisions associated with the permitting of new stationary diesel-fueled engines that are greater than 50 horsepower. The Guidance, approved by the Board in September 2000, identifies minimum technology requirements and performance standards for reducing particulate matter emissions from new stationary diesel-fueled engines. It identifies engine categories that may be approved without a site-specific health risk assessment (HRA), provided either the minimum technology requirements or performance standards are met. The Guidance also discusses diesel-specific adjustments that may be used when a site-specific HRA is required. (ARB, 2000a) (ARB, 2002)

The key recommendations in the Guidance are:

- Approve permits for diesel-fueled engines if they meet the appropriate performance standards or minimum technology requirements (see Table III-1). Meeting the appropriate minimum technology requirements or performance standards will result in the application of the best available control technologies (BACT) and the lowest achievable risk levels, in consideration of costs, uncertainty in the emissions and exposure estimates, and uncertainties in the approved health values. For these engines, a site-specific HRA is not required.

- Emergency standby engines are not required to meet add-on control or very-low sulfur fuel requirements until the stationary compression ignition ATCM is approved.

- Require a site-specific HRA prior to approval for prime diesel-fueled engines that operate over 400 hours per year (see Table III-1). If the HRA estimates a potential cancer risk greater than or equal to of 10 chances in a million, we suggest the district review additional site-specific information; e.g., site specific design considerations, location of sensitive receptors, and alternative technologies or fuels; before making a permitting decision. This information should be summarized in a Specific Findings (SF) Report. We further recommend the public be provided the opportunity to review and comment on the proposed permit action. The APCO would consider the public's comments in making the final permitting decision.

- Conduct risk assessments consistent with the *California Air Pollution Control Officers Association (CAPCOA), Air Toxics "Hot Spots" Program, Revised 1992 Risk Assessment Guidelines* (Risk Assessment Guidelines), dated October 1993[6], and the risk assessment guidance presented in the Guidance. Use diesel PM as a surrogate for all TAC emissions from diesel-fueled engines when determining the

[6] The Office of Environmental Health Hazard Assessment (OEHHA) has just completed new risk assessment guidelines and anticipates adoption in 2003.

potential cancer risk and the noncancer chronic hazard index for the inhalation pathway.

- Estimate risk using the Scientific Review Panel's (SRP) recommended unit risk factor of 300 excess cancers per million per microgram per cubic meter of diesel PM [$3 \times 10^{-4} (\mu g/m^3)^{-1}$] based on 70 years of exposure.

- Consider the overall benefit for the project and the uncertainty in the risk assessment information when making risk management decisions.

**Table III-1: Recommended Permitting Requirements for New Stationary Diesel-Fueled Engines**

| Engine Category | Annual Hours of Operation | Group | Performance Standard[1] (g/bhp-hr) | Minimum Technology Requirements | | | Additional Requirements | |
|---|---|---|---|---|---|---|---|---|
| | | | | New Engine PM Emission Levels[1] (g/bhp-hr) | Fuel Technology Requirements | Add-On Control | HRA Required | SF Report |
| Emergency/ Standby > 50 hp[2] | ≤ 100 hours[3] | 1 | 0.15[4] | 0.15[4] | CARB Diesel or equivalent | No | No | No |
| All Other Engines > 50 hp | ≤ 400 hours | 1 | 0.02 | 0.15[4] | Very low-sulfur CARB Diesel or equivalent[5] | Catalyst-based DPF or equivalent | No | No |
| | > 400 hours | 2 | 0.02 | 0.15[4] | Very low-sulfur CARB Diesel or equivalent[5] | Catalyst-based DPF or equivalent | Yes | If HRA shows risk > 10/million |

HRA - Health Risk Assessment; SF - Specific Findings; DPF - Diesel Particulate Filter

1. *California Exhaust Emission Standards and Test Procedures for New 1996 and Later Off-Road Compression–Ignition Engines*, May 12, 1993, incorporating as referenced, ISO/DP 8178 Test Procedure, Part 1, June 3, 1992, Part 4, June 30, 1992, and Part 5, June 3, 1992.
2. The emergency standby engine category is valid until March 2002, or until the analysis supporting the Emergency Standby Retrofit ATCM is complete, whichever is sooner. At that time, emergency standby engines will be required to meet the *All Other Engine >50 hp* requirements. New emergency standby engines must be "plumbed" to facilitate the installation of a catalyst-based DPF at a later date.
3. The annual hours of operation for emergency standby engines include the hours of operation for maintenance and testing runs only.
4. Includes an update and clarification made to the Guidance in a letter to the Districts on March 29, 2002. (Venturini, 2002)
5. Very low sulfur (≤ 15 ppmw) CARB diesel or equivalent is only required in areas where the district determines it is available in sufficient quantities and economically feasible to purchase. CARB diesel is required to be used in all other areas.

Distributed Generation

Distributed generation (DG) refers to the electrical generation near the place of use. DG units can generate electricity using a variety of technologies- solar (photovoltaics); wind; fuel cells; diesel, natural gas, and gasoline fueled engines; and microturbines. A DG unit is usually sized to meet the power needs of the business or residence at which it is located. Because some DG units are relatively small, some of California's 35 air pollution control districts (districts) do not require that an air quality permit be obtained for this type of equipment.

Senate Bill 1298 (SB 1298), which was chaptered in September 2000, required the ARB to adopt emission standards and establish a certification program for distributed generation technologies that are exempt from air pollution control or air quality management district permit requirements. The ARB also developed guidance to the air districts on the permitting or certification of electrical generation technologies that are subject to district permit.

The following paragraphs summarize the requirements of both the certification regulation and the guidance.

*DG Certification Regulation Requirements*

- Distributed generation sources must be certified by the ARB before they can be sold in California *if they are exempt from district permit requirements.*
- The DG Certification emission standards for 2003 and 2007 are summarized in Tables III-2 and III-3 below.

**Table III-2: Distributed Generation January 1, 2003 Emission Standards**

| Pollutant | DG Unit not Integrated with Combined Heat and Power | DG Unit Integrated with Combined Heat and Power |
|---|---|---|
| NOx | 0.5 lb/MW-hr (0.17 g/bhp-hr) | 0.7 lb/MW-hr (0.24 g/bhp-hr) |
| CO | 6.0 lb/MW-hr (2.0 g/bhp-hr) | 6.0 lb/MW-hr (2.0 g/bhp-hr) |
| VOCs | 1.0 lb/MW-hr (.34 g/bhp-hr) | 1.0 lb/MW-hr (0.34 g/bhp-hr) |
| PM | An emission limit corresponding to natural gas with fuel sulfur content no more than 1 grain/100scf | An emission limit corresponding to natural gas with fuel sulfur content no more than 1 grain/100scf |

**Table III-3: Distributed Generation January 1, 2007 Emission Standards**

| Pollutant | All DG Units |
|---|---|
| NOx | 0.07 lb/MW-hr (.02 g/bhp-hr) |
| CO | 0.10 lb/MW-hr (.03 g/bhp-hr) |
| VOCs | 0.02 lb/MW-hr (.007 g/bhp-hr) |
| PM | An emission limit corresponding to natural gas with fuel sulfur content no more than 1 grain/100scf |

The above standards are not currently achievable by diesel-fueled compression ignition engine technology. They are achievable by natural gas fired microturbine and fuel cell technology.

*DG Guidance Document*

The ARB developed guidance for electrical generation technologies *that are subject* to district permits. These technologies included reciprocating engines. The purpose of the guidance is to assist the air districts in making permitting decisions for electrical generation technologies that are subject to district permits. The guidance includes recommended Best Available Control Technology (BACT) levels and suggested permit conditions

The Table below summarizes the BACT recommendations for Reciprocating Engines used in Distributed Generation Applications.

**Table III-4: Summary of BACT for the Control of Emissions from Reciprocating Engines Used in Electrical Generation**

| Equipment Category | NOx lb/MW-hr | VOC lb/MW-hr | CO lb/MW-hr | PM lb/MW-hr |
|---|---|---|---|---|
| Fossil fuel fired | 0.5 (0.15 g/bhp-hr or 9 ppmvd*) | 0.5 (0.15 g/bhp-hr or 25 ppmvd*) | 1.9 (0.6 g/bhp-hr or 56 ppmvd*) | 0.06 (0.02 g/bhp-hr) |

* lb/MW-hr standard is equivalent to g/bhp-hr and ppmdv expressed at 15 percent $O_2$. Concentration (ppmdv) values are approximate.

AB 2588 "Hot Spots" Information and Assessment Act

The Air Toxics "Hot Spots" Information and Assessment Act (Assembly Bill (AB) 2588) was enacted in September 1987 (Health and Safety Code 44300-44394). AB 2588 requires inventories of certain substances that facilities routinely release into the air. Emissions of interest are those that result from the routine operation of a facility or that are predictable, including but not limited to continuous and intermittent releases and process upsets or leaks.

The goals of the Air Toxics "Hot Spots" Act are to collect emissions data, to identify facilities having localized impacts, to ascertain health risks, and to notify nearby residents of significant risks. In September 1992, the "Hot Spots" Act was amended by Senate Bill (SB) 1731 to address the reduction of significant risks. The bill requires owners of significant-risk facilities to reduce their risks below the level of significance.

Since the amendment of the statute in 1992 by enactment of SB 1731, facilities that pose a potentially significant health risks to the public are required to reduce their risks, thereby reducing the near-source exposure of Californians to toxic air pollutants. Owners of facilities found to pose significant risks by a district must prepare and implement risk reduction audit and plans within six months of the determination.

AB 2588 requires the ARB to compile and maintain a list of substances posing chronic or acute health threats when present in the air. The Air Toxics "Hot Spots" Act currently identifies by reference over 600 substances which are required to be subject to the program. The ARB may remove substances from the list if criteria outlined in the law are met. A facility is subject to AB 2588 if it: 1) manufactures, formulates, uses, or releases a substance subject to the Act (or substance which reacts to form such a substance) and emits 10 tons or more per year of total organic gases, particulate matter, nitrogen oxides or sulfur oxides; 2) is listed in any district's existing toxics use or toxics air emission survey, inventory or report released or compiled by a district; or 3) manufactures, formulates, uses, or releases a substance subject to the Act (or substance which reacts to form such a substance) and emits less than 10 tons per year of criteria pollutants and is subject to emission inventory requirements.

Guidance documents are currently available for conducting emission inventories, facility prioritizations, risk assessments, and public notifications. ARB developed the *Emission Inventory Criteria And Guidelines* for conducting emission inventories, while CAPCOA developed the *Facility Prioritization Guidelines*, *Risk Assessment Guidelines*, and the *Public Notification Guidelines*. In August 1998, the ARB approved the listing of diesel PM as a TAC and the SRP conclusion that a value of $3 \times 10^{-4}$ $(ug/m^3)^{-1}$ is a reasonable estimate of unit risk from diesel-fueled engines. Now that a unit risk factor has been approved, districts are required to reevaluate the classification of facilities subject to the "Hot Spots" program, specified in Health & Safety Code section 44320, operating stationary diesel-fueled engines.

Currently, diesel-fueled engines or facilities with multiple diesel-fueled engines must meet AB 2588 requirements if they use 3,000 or more gallons per year of diesel fuel, but are exempt from AB 2588 if they use less than 3,000 gallons per year. As discussed in Chapter X of this report, ARB staff is currently developing amendments to the "Hot Spots" Emission Inventory Criteria and Guidelines regulation to address all diesel-fueled engines.

Carl Moyer Program

The Carl Moyer Memorial Air Quality Standards Program (Carl Moyer Program) is a grant program that funds the incremental cost of cleaner-than-required engines and equipment. Public or private entities that operate eligible engines and/or equipment in California can participate by applying directly to their local air pollution control or air quality management districts (districts). Examples of eligible engines and equipment include heavy-duty on-road and off-road, marine, locomotive, stationary agricultural pumps, forklifts, airport ground support equipment, and heavy-duty auxiliary power units.

The Carl Moyer Program provides funds for significant near-term reductions in emissions of oxides of nitrogen (NOx), a smog-forming pollutant, and PM emissions. These reductions are necessary for California to meet its clean air commitments under the State Implementation Plan (SIP) and for air districts to meet commitments in their conformity plans, thus preventing the loss of federal highway funds for local areas throughout California. In 2000, the Carl Moyer Program guidelines were revised to set a statewide program goal to achieve a 25 percent emission reduction for PM for the third and future year program. Local air districts such as South Coast Air Quality Management District and San Joaquin Valley Unified Air Pollution Control District, which are in serious non-attainment for the federal PM standard, are required to meet a 25 percent PM emission reduction for the local program.

In its first three years (through fiscal year 2000/2001), the Carl Moyer Program has funded the replacement of over 1,900 stationary agricultural pumps, which constituted 28 percent of the total program funding. Based on local program data from the first three years provided by the districts, ARB estimates total PM reductions from the Carl Moyer Program to be approximately 65 tons per year. (ARB, 2002)

Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) is a federally-funded incentive program administered by the United States Department of Agriculture (USDA). The EQIP regulatory language was chaptered in 1998. The EQIP program is a voluntary conservation program that promotes environmental quality and provides technical and financial assistance to agricultural producers to assist them in meeting local, state, and federal regulations.

Recently, EQIP funding has been directed towards the agricultural community's efforts to reduce air emissions. Those efforts include replacing older, dirty agricultural engines with newer, cleaner models, oiling roads, and chipping orchard waste instead of burning it. On May 1, 2003, Agricultural Secretary Ann M. Veneman announced that California would be allocated approximately $38 million for the EQIP program. Of those monies, approximately $3.5 million has been set aside to fund the replacement of approximately 300 stationary agricultural irrigation engines throughout California. The Assistant State Conservationist (programs), with the United States Department of Agriculture's Natural

Resources Conservation Service (NRCS), informed ARB staff that, in addition to the $3.5 million set aside to finance the replacement of agricultural irrigation engines, another $2 million has been allocated to fund additional air quality abatement methods, including oiling roads and chipping orchard waste. It was also reported that the NRCS would be recommending that $15 million be allocated for the EQIP Program next year. (Flach, 2003)

The EQIP funds can be used to replace existing stationary diesel-fueled agricultural engines with engines certified to the Tier II lower emission standards for nonroad engines, replace older diesel-fueled agricultural pump engines with pump motors powered by electricity, or install electric agricultural pump motors on new wells. The USDA will provide up to fifty percent of the cost to replace older, higher emitting stationary diesel engines.

Engines eligible for replacement are those in counties whose air has been classified as either severe or extreme non-attainment for ozone as defined by the federal Clean Air Act. This includes all, or a portion of, the following counties in California: El Dorado (except the Lake Tahoe Basin), Fresno, western Kern, Kings, Los Angeles, Madera, Merced, Orange, Placer (except the Lake Tahoe Basin), Riverside, Sacramento, northern and western San Bernardino, San Joaquin, eastern Solano, Stanislaus, southern Sutter, Tulare, and Ventura.

ARB staff worked with the USDA and U.S. Environmental Protection Agency staff to ensure that emission benefits associated with the EQIP were real, surplus, and quantifiable. In addition, ARB staff continues to work with the staff of the San Joaquin Valley Unified Air Pollution Control District to help implement the program.

## C. Surveys for Emergency Standby and Prime Stationary Diesel-Fueled Engines

### Emergency Standby Stationary Diesel-Fueled Engine Survey

In September 2002, ARB staff conducted an emergency standby diesel-fueled engine survey (ES Survey), using contact data acquired from local air pollution control and air quality management district (District) operating permits and the California Energy Commission's *Database of Public Back-Up Generators*. (CEC, 2001) Among other things, the intent of the Survey was to obtain a representative sampling of the average number of hours that emergency standby diesel-fueled engines were operated in California.

The Survey was distributed to private companies and facilities, as well as public entities, including county, city, state, and federal agencies throughout California. The ES Survey asked owners/operators to provide for each of their emergency standby diesel-fueled engines over 50 hp, the permit number (if the engine were permitted with the District), engine make, model, horsepower, model year or approximate age, and actual hours of operation for the calendar years 1999 through 2001. The hours of operation were broken down into the following three categories:

- Maintenance and testing
- Interruptable Service Contracts [7]
- Emergencies

Of the approximately 3,000 surveys distributed, over 800 were returned with data for approximately 3,200 engines. Responding facilities were sorted into categories, which included parks, banks, nuclear power plants, hotels/motels, agriculture (food growing and production facilities, wineries, and meat processing plants), police/fire, film/TV/radio, oil/fuel/refineries, correctional, schools, waste/sanitation, other power agencies, other government agencies, hospitals, water and publicly owned treatment works (POTWs), military, telecommunications, and other private business.

The "other private business" category included, but was not limited to, building property management companies (i.e., office buildings) and retail stores. Of the total responses, 50 percent were from private companies/facilities, 42.5 percent were from public agencies (county, city, state, and federal), and 7.5 percent were undetermined.

Hours of operation data was collected for 3,038 engines. The ES Survey engines operated, on average, about 31 hours per year. However, 77 percent of those hours were for maintenance and testing, with an average of 22 hours per year. Additionally, 95 percent of all engines operated less than 50 hours per year for maintenance and testing, while 85 percent operated less than 30 hours per year. Of the facility types determined for this survey, only four had average maintenance and testing operation that exceeded 30 hours per year: schools (63.71 hours),[8] nuclear power plants (42.49 hours), hospitals (35.42 hours), and correctional facilities (30.64 hours). The four facility types combined comprised approximately 15 percent of the survey engines.

The average annual hours of operation for each activity are reported in Table III-5 below. Additional data can be found in Appendix B.

[7] Interruptable Service Contracts, also known as Interruptable Loan Contracts/Programs, are contractual agreements between the engine owners/operators and electric supply companies to provide load reduction during periods of fuel or energy shortage in return for economic compensation or benefit.
[8] The hours may not be representative due to the low number of school responding (3 percent of the total number of responses).

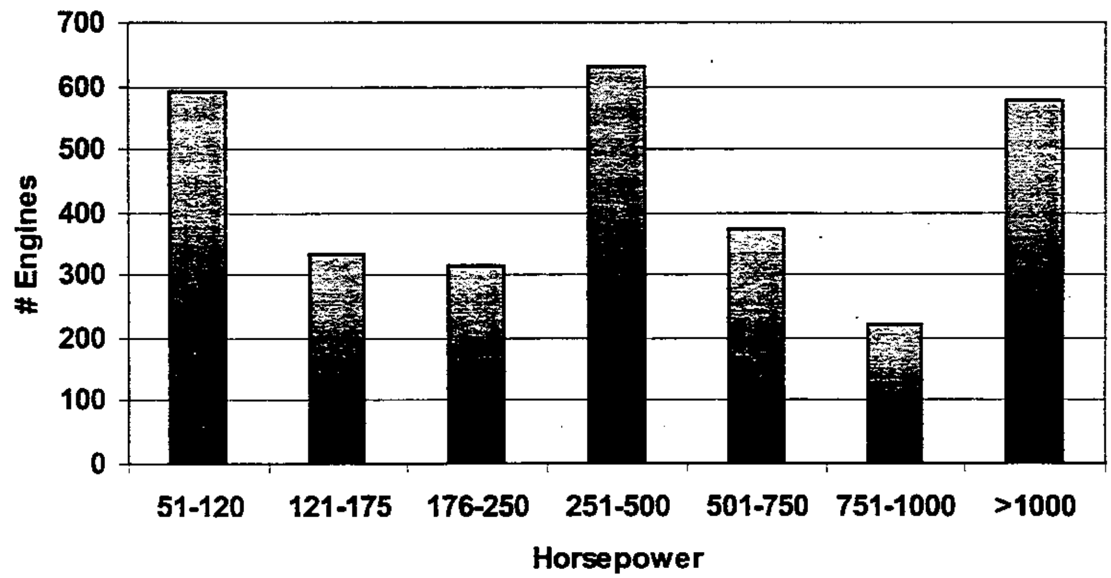
**Table III-5: Average Annual Hours of Operation for Emergency Standby Engines**

| Activity | Year | | |
|---|---|---|---|
| | 1999 | 2000 | 2001 |
| Maintenance and Testing | 22 | 22 | 21 |
| Interruptable Service Contract | 1 | 3 | 4 |
| Emergency | 6 | 6 | 8 |
| Total | 29 | 31 | 33 |
| **Average Total Annual Hours of Operation** | **31** | | |

The primary engine manufacturers reported in the ES Survey were Caterpillar, Cummins, and Detroit Diesel, which combined, comprised 72 percent of all survey engines. Other manufacturers included, but were not limited to John Deere, Ford, Generac, Isuzu, Onan, Perkins, Allis-Chalmers.

Survey engines ranged in horsepower from less than 50 to over 6,000. As shown in Figure 1, the largest numbers of engines were in the 251 to 500, 51 to 120, and greater than 1,000 horsepower ranges, respectively. The average engine horsepower was 604.

**Figure III-1: Emergency Standby Engine Survey - Horsepower Distribution**




Age or model year data was collected for 2,612 engines. Ages varied greatly, from new (model year 2002 or newer) to 57 years old. However, only 3 percent were more than 30 years old, and the largest number of engines (37 percent) were model years 1988 to 1995. Approximately 31 percent of the engines were model year 1996 or newer.

Only 236 engines, about 8 percent, reported hours of operation for ISC programs. Of those engines, the average annual operation for ISC purposes was approximately 26 hours. The average number of ISC hours increased during the three-year period (1999 through 2001), with a 245 percent increase from 1999 to 2000 and a 43 percent increase from 2000 to 2001. However, not all engines had increases in ISC hours. From 1999 to 2000, 56 percent of the engines experienced an increase and 62 percent showed an increase from 2000 to 2001.

Prime Stationary Diesel-Fueled Engine Survey

In March 2003, the Air Resources Board (ARB or Board) conducted the Stationary Diesel-Fueled Prime Engine Survey (Prime Survey) using contact data from District operating permits. The intent of the Prime Survey was to obtain a representative sampling of how prime stationary diesel-fueled engines are operated in California and the applications for which they are used. The information gathered would enable us to determine how many engines would potentially be affected by the proposed ATCM for stationary compression-ignition engines and would also, in combination with the ES Survey, aid in enhancing our statewide inventory of stationary diesel-fueled engines.

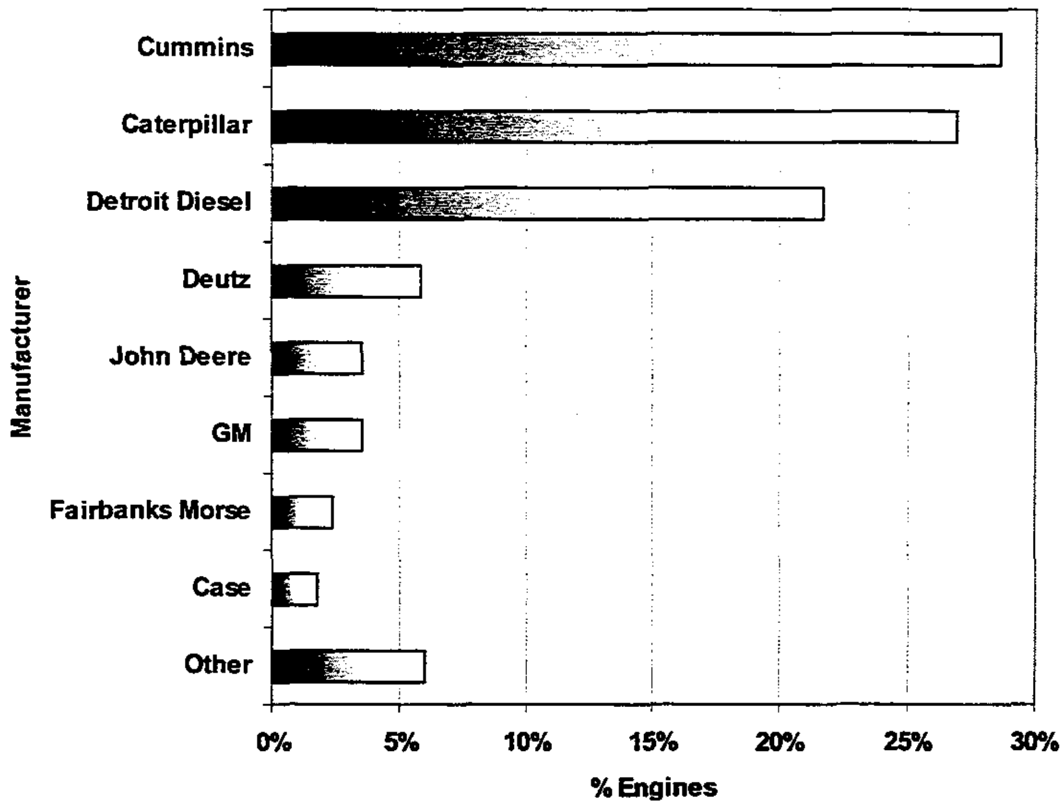
Like the ES Survey, the Prime Survey was distributed to private companies and facilities and public entities, including county, city, state, and federal agencies throughout California (approximately 560 in all). Respondents were asked to provide for each of their prime compression-ignition engines, the manufacturer, model, serial number, model year, rated horsepower, emission control equipment, fuel type and usage rate, application, typical load, average total hours operated per year, and normal operating hours (daily, weekly, etc.). Not all of the data fields were analyzed given the limited number of engines for which data was received.

As of this writing, 59 Prime Surveys were returned with data for 171 diesel-fueled engines. Several additional surveys were returned for engines that use natural gas as a fuel, and those were not included in our analysis. Responding facilities were sorted into categories, which included military, oil/fuel/refineries, power generating and distributing facilities, waste and recycling centers, rock/sand/gravel plants, manufacturing facilities, airlines, resorts, POTWs, agricultural facilities (food growing and production companies, wineries, and meat processing plants), construction companies, miscellaneous government agencies, and other private businesses.

The "other private businesses" included auto wrecking facilities, shipping container facilities, and other miscellaneous business types. Of the total responses, 63 percent were from private companies/facilities and 37 percent were from public agencies (county, city, state, and federal).

The most prominent engine manufacturers from the Prime Survey were Caterpillar, Cummins, and Detroit Diesel, totaling 77 percent of the engines (see Figure III-2). Engine models varied significantly and are presented in Appendix C. Other manufacturers included, but were not limited to, Deutz, Fairbanks-Morse, General Motors, John Deere, Case, Allis-Chalmers, Isuzu, and Perkins.

**Figure III-2: Prime Engine Survey - Manufacturers**

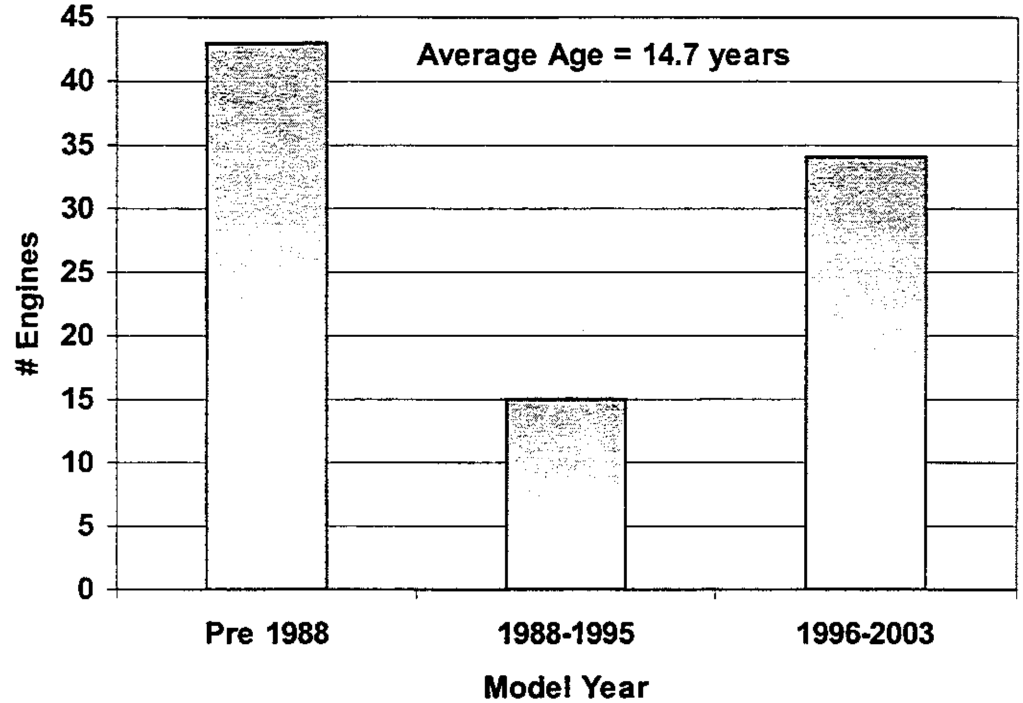



There were many different application types represented in the Prime Survey, such as air compressors, cranes, crushers, generators, grinders, hay compressors, pumps, turbine starters and wood chippers, to name a few. The largest number of engines were generators (33 percent), followed by cranes (15 percent).

Prime Survey engines ranged in horsepower from under 50 to over 2,000. The most populated categories were 300 to 599 horsepower, greater than 750 horsepower, and 100 to 174 horsepower, representing 66 percent of the survey engines. The average horsepower for all of the prime engines was 556.

Model year data was received for 92 of the 171 engines and sorted into three model year groups: pre-1988, 1988 to 1995, and 1996-2003 (see Figure III-3). About 53 percent of the engines were 1988 or newer, with 37 percent being model year 1996 or newer. The average age was approximately 15 years.

Figure III-3: Prime Engine Survey - Engine Model Years




Hours of operation data was collected for 132 engines, with an average annual amount of 953 hours. Average hours were calculated for each application and are shown in Table III-6.

**Table III-6: Prime Engine Average Hours of Operation by Application**

| Application | Average Annual Hours |
|---|---|
| air compressor | 334 |
| cogeneration | 5501 |
| crane | 1024 |
| crusher | 1114 |
| generator | 1563 |
| grinder | 798 |
| hay compressor | 1482 |
| magnetic silencer | 8 |
| mud mixer | 517 |
| pump | 46 |
| sand blaster | 313 |
| turbine starter | 22 |
| winch | <50 |
| wood chipper | 869 |
| other | 852 |

Many of the engines from the Prime survey had advanced emission controls, such as diesel particulate filters (DPFs), diesel oxidation catalysts (DOCs), and selective catalytic reduction (SCR). Eighteen engines utilized at least one of these technologies, and several used one in conjunction with another (i.e., DPF with SCR).

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California Air Resources Board. *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines*; October 2000. (ARB, 2000a)

California Air Resources Board. *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*; October 2000. (ARB, 2000b)

California Energy Commission. *Inventory of Backup Generators in the State of California*; December 2001. (CEC, 2001)

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# IV. EMISSIONS, POTENTIAL EXPOSURES, AND RISK

This chapter presents the most recent emissions inventory for stationary diesel-fueled engines in California as well as a discussion on the potential cancer health risks that may occur due to the operation of stationary diesel-fueled engines.

## A. Estimated Emissions from Stationary Diesel-Fueled Engines

To develop an emissions estimate of the emissions from stationary diesel-fueled engines used in non-agricultural applications, ARB staff developed a methodology that integrated information from national engine sales data, local district permit data, and information collected in the ARB Surveys. Emission projections to 2020 were also developed using our best estimates of expected growth, engine turnover, and age distribution. For stationary diesel-fueled engines used in agricultural applications, ARB staff worked closely with the local districts and the agricultural community to create an estimate of the emissions from stationary diesel-fueled engines used in agricultural operations. Because of the limited data available for agricultural stationary engines, ARB staff was not able to project the emissions for future years with any degree of certainty. In this chapter, only emission estimates for the year 2001 are provided for stationary engines used in agricultural operations. Details of the methodologies and the supporting documentation are found in Appendix D. Based on the information available to date, we believe the methodologies have resulted in a reasonable estimate of the emissions from stationary diesel-fueled engines. However, upon implementation of the proposed ATCM, more detailed data will be available to allow for a more robust emissions estimate for non-agricultural (non-ag) applications in the July 2005 timeframe once engine operators submit the required information on engine characteristics and activity. We intend to also continue to work with agricultural representatives to refine the estimates for agricultural engines.

### Current Emission Estimates for Stationary Diesel-Fueled Engines

We estimate that the operation of stationary diesel-fueled engines results in approximately 2.6 tons per day or 950 tons per year of diesel PM emissions. Of this, non-agricultural applications are responsible for approximately 40 percent (400 T/Y) of the emissions and agricultural applications about 60 percent (550 T/Y). In addition, based on an average statewide NOx to PM conversion factor of 0.1 $gNH_4NO_3/gNOx$, we estimate the secondary formation of $PM_{10}$ nitrate from NOx emissions from diesel-fueled stationary engines to be about four tons per day.[9] Estimates for current statewide diesel PM, NOx, and NMHC emissions from all stationary diesel-fueled engines are presented in Table IV-1.

[9] The conversion factor for the transformation of NOx to $NH_4NO_3$ was based on a simplistic analysis of annual-average conversion factors for secondary formation of $PM_{10}$ nitrate from NOx emissions at a number of urban sites in California. The values varied from 0.04 to 0.19 $gNH_4NO_3/gNOx$ depending on the site. To estimate the statewide secondary formation of $PM_{10}$ from stationary engines, we assumed half the engines were in areas with a 0.19 $gNH_4NO_3/gNOx$ conversion rate and half in areas with a 0.04 conversion rate, resulting in an overall 0.1 $gNH_4NO_3/gNOx$ value.

**Table IV-1: Stationary Diesel-Fueled Engines Year 2002 Emissions Estimates**

| Category | Number of Engines | Emission, Tons per Day | | | |
|---|---|---|---|---|---|
| | | PM | NOx | ROG | CO |
| Prime | 1,319 | 0.8 | 13.8 | 1.3 | 4.8 |
| Agricultural Prime* | 5,338 | 1.5 | 21.1 | 4.3 | 5.8 |
| Emergency Standby | 19,659 | 0.3 | 6.4 | 0.5 | 2.1 |
| Total | 26,321 | 2.6 | 41.3 | 6.1 | 12.7 |

*Emission estimates for agricultural engines are for 2001.

As shown in Table IV-1, there are approximately 26,000 stationary diesel-fueled engines in California. Of these, the majority, or 75 percent are used in emergency standby applications. However, because of the low operating hours for emergency standby engines, this category accounts for only about 10 percent of the total diesel PM emissions. A similar relationship is seen with the other pollutants as well. Prime applications (both agricultural and non-agricultural) are responsible for about 25 percent of the engines and about 90 percent of the diesel PM emissions. Agricultural engines (primarily irrigation pumps) are responsible for about 20 percent of the total number of stationary diesel-fueled engines in California.

Projected 2010 and 2020 Emission Estimates for Stationary Diesel-Fueled Engines Used in Non-Agricultural Applications

The projected uncontrolled emission estimates for the years 2010 and 2020 are presented in Table IV-2. As discussed in the methodology included in Appendix D, these estimates were developed using growth and control factors developed with input from district staff and representatives of several engine manufacturers. Those inputs include the number of diesel-fueled engines that enter the California non-ag stationary diesel-fueled engine population and the numbers of engines retired annually. These estimates include benefits from the new engine standards and turnover in the engine population but do not include the projected reductions expected from implementation of the proposed ATCM. Expected emission reductions and the impact on the emissions inventory are discussed in Chapter VIII, Environmental Impacts.

**Table IV-2: Stationary Diesel-Fueled Engines Used in Non-Agricultural Applications Projected Uncontrolled Year 2010 and 2020 Emissions Estimates**

| | 2010 Emissions, Tons per Day | | | | 2020 Emissions, Tons per Day | | | |
|---|---|---|---|---|---|---|---|---|
| **Category** | **PM** | **NOx** | **ROG** | **CO** | **PM** | **NOx** | **ROG** | **CO** |
| Prime | 0.4 | 8.5 | 0.7 | 2.6 | 0.2 | 4.9 | 0.4 | 1.5 |
| Emergency Standby | 0.2 | 5.6 | .4 | 1.7 | 0.1 | 4.6 | 0.2 | 1.4 |
| Total | 0.6 | 14.1 | 1.1 | 4.3 | 0.3 | 9.5 | 0.6 | 2.9 |

## B. Potential Exposures and Risk from Diesel PM Emissions from Stationary Diesel-Fueled Engines

This section examines the potential exposures and cancer health risks associated with exposure to particulate matter emissions from stationary diesel-fueled engines. A brief qualitative discussion is provided on the potential exposures of Californians to the diesel PM emissions from stationary engines. In addition, a summary is presented of the health risk assessment conducted to determine the 70-year potential cancer risk associated with exposures to diesel PM emissions from stationary diesel-fueled engines. Additional details on the methodology used to estimate the health risks are presented in Appendix E of this report.

### Potential Exposures

As discussed previously, stationary diesel-fueled engines are used in a variety of applications and contribute to ambient levels of diesel PM emissions. Because analytical tools to distinguish between ambient diesel PM emissions from stationary diesel-fueled engines from other sources of diesel PM do not exist, we cannot measure the actual exposures to persons from the emissions of stationary diesel-fueled engines. However, modeling tools can be used to estimate potential exposures to the emissions from stationary diesel-fueled engines.

Based on the most recent emissions inventory, there are over 26,000 stationary diesel-fueled engines operating in California. These engines are distributed throughout California. The majority of these engines are emergency standby engines, engines used to provide back-up power to hospitals, hotels, schools, businesses, water treatment facilities and the like. Engines used in emergency standby applications tend to be located in urban centers where the probability of a person living close to an emergency standby engine is higher. For example, based on the emissions inventory, approximately 40 percent of the total emergency standby engines statewide are located within the South Coast air basin and 80 percent are located within four air basins: San Francisco, San Diego, San Joaquin Valley, and South Coast. In September 2002, Environmental Defense published their results from a comprehensive study of the impacts of operating emergency standby engines in California. The study was based on the California Energy Commission's database of emergency standby engines and concluded, among other things, that emergency standby engines tend to be located near where people live, work, and go to school. (Ryan, 2002) Based on this information, we believe that there are substantial exposures to diesel PM emissions from the operation of stationary diesel-fueled engines in California. As presented below these exposures can result in potential cancer health risks.

Health Risk Assessment

Risk assessment is a complex process that requires the analysis of many variables to simulate real-world situations. There are three key types of variables that can impact the results of a health risk assessment for stationary diesel-fueled engines – the magnitude of diesel PM emissions, local meteorological conditions, and the length of time someone is exposed to the emissions. Diesel PM emissions are a function of the age and horsepower of the engine, the emissions rate of the engine and the annual hours of operation. Older engines tend to have higher pollutant emissions rates than newer engines, and the longer an engine operates, the greater the total pollutant emissions. Meteorological conditions can have a large impact on the resultant ambient concentration of diesel PM, with higher concentrations found along the predominant wind direction and under calm wind conditions. How close a person is to the emissions plume and how long he or she breathes the emissions (exposure duration) are key factors in determining potential risk with longer exposures times typically resulting in higher risk.

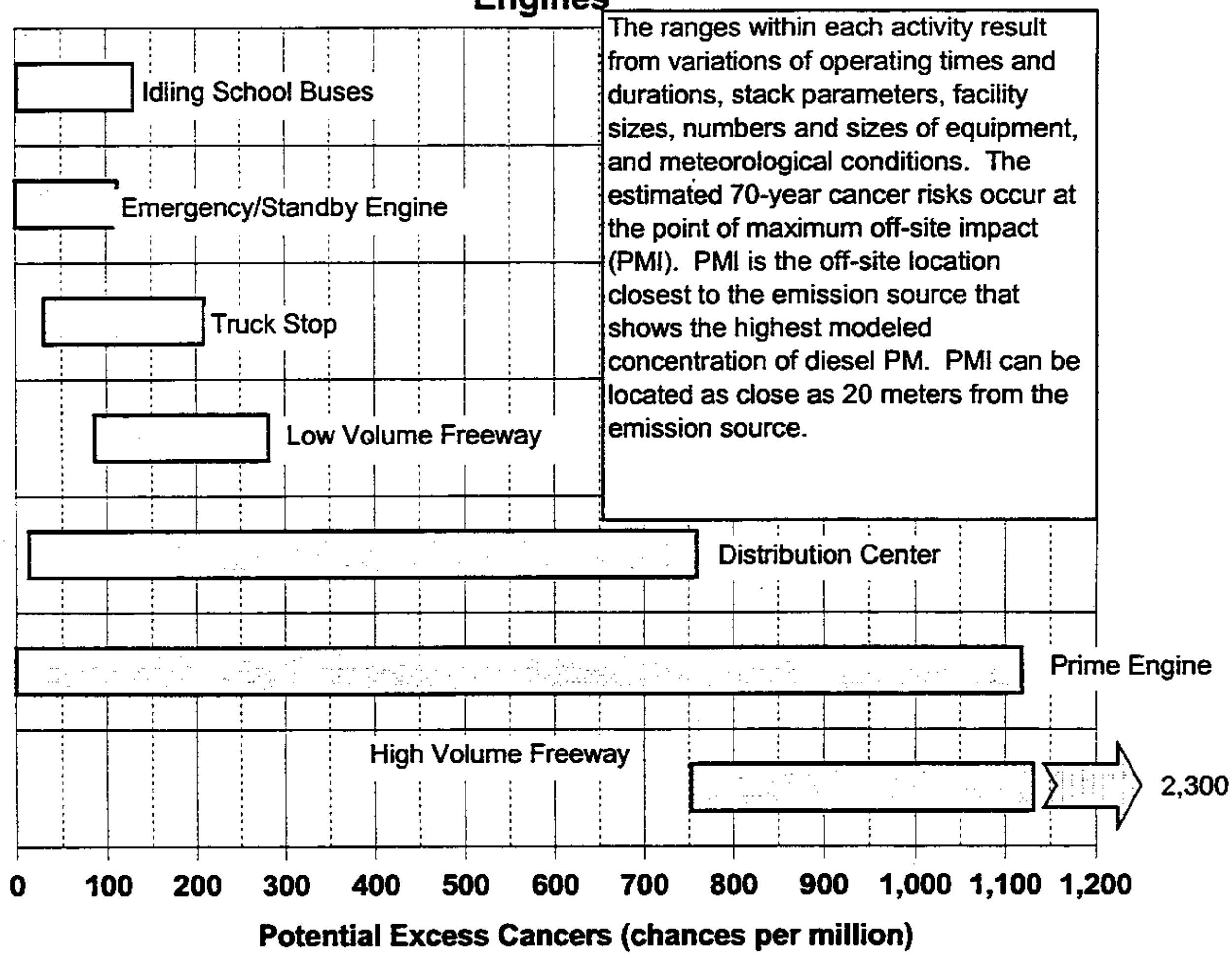
Because risk estimates for stationary diesel-fueled engines are dependent on numerous factors and because these factors vary from location to location, ARB staff developed a generic risk assessment for stationary diesel-fueled engines. We evaluated a range of emission rates and hours of operation bracketing a fairly broad range of possible operating scenarios. Meteorological data from West Los Angeles (1981) was selected to provide meteorological conditions with lower wind speeds and more persistent wind directions, which will result in less pollutant dispersion and higher estimated risk. The U.S. EPA's ISCST3 air dispersion model was used to estimate the annual average diesel PM concentration at the point of maximum impact.

The estimated annual average diesel PM concentrations were then adjusted following the current risk assessment methodology recommended by the Office of Environmental Health Hazard Assessment (OEHHA) and used by ARB in evaluating potential cancer risk from diesel PM emission sources. (OEHHA, 2002a) (OEHHA, 2002b) (OEHHA, 2000) Following the OEHHA guidelines, we assumed that the most impacted individual would be exposed to modeled diesel PM concentrations for 70 years. This exposure duration represents an "upper-bound" of the possible exposure duration. The potential cancer risk was estimated by multiplying the modeled current annual average concentrations of diesel PM, adjusted for the duration of exposure, by the unit risk factor for diesel PM (300 excess cancers per million people/microgram/cubic meter of diesel PM).

Based on our analysis under the conditions outlined above, the estimated cancer risk for persons most exposed to the emissions from emergency standby diesel-fueled engines ranged from near 0 to over 100, and for prime from near 0 to well over 1,000. The low end in each case represents a very clean engine operating only a few hours annually and the high end, an engine with a relatively high emission rate operating for many hours each year. As shown in Figure IV-1 on the next page, when compared to other activities using diesel-fueled engines, it can be concluded that stationary diesel-fueled engines, particularly those in prime applications, can pose significant near-source risks to populations living in close proximity to the engines.

The estimated risk levels presented here are based on a number of assumptions. The potential cancer risk for actual situations may be less than or greater than those presented here. For example, an increase in the emissions rate of an engine or the annual hours of operation would increase the potential risk levels. A decrease in the exposure duration or an increase in the distance from the engine would decrease potential risk levels. The estimated risk levels would also decrease over time as newer, lower-emitting stationary diesel-fueled engines replace older engines. Therefore, the results presented are not directly applicable to any particular stationary engine. Rather, this information provides an indication as to the potential relative levels of risk that may be attributed to stationary diesel-fueled engines and to act as an example when performing a site-specific risk assessment for stationary diesel-fueled engines.

## Figure IV-1: Cancer Risk Range of Activities Using Diesel-Fueled Engines




(Note: The risk ranges for the non-stationary engine scenarios are taken from the DRRP. The upper bounds have been adjusted to reflect the 95th percentile breathing rate. The upper bounds for the emergency standby and prime stationary engines are for 0.55 g/bhp-hr engines operating 100 hr/yr and 2,000 hr/yr, respectively.)

**REFERENCES:**

Office of Environmental Health Hazard Assessment. *Air Toxics Hot Spots Program Risk Assessment Guidelines: The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*; 2002. (OEHHA, 2002a)

Office of Environmental Health Hazard Assessment. *Air Toxics Hot Spots Program Risk Assessment Guidelines, Part II, Technical Support Document for Describing Available Cancer Potency Factors*; 2002. (OEHHA, 2002b)

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Ryan, Nancy E., et al. *Smaller, Closer, Dirtier DIESEL BACKUP GENERATORS IN CALIFORNIA*, Environmental Defense; September 2002. (Ryan, 2002)

# V. SUMMARY OF PROPOSED CONTROL MEASURE FOR STATIONARY COMPRESSION IGNITION ENGINES

In this chapter, we provide a plain English discussion of the key requirements of the proposed air toxic control measure (ATCM) for new and in-use stationary diesel-fueled compression ignition (CI) engines. This chapter begins with a general overview of the ATCM and the approach we took in developing the emission standards and operational limits defined by the ATCM. The remainder of the chapter is structured in accordance with the structure of the ATCM. Each major requirement of the ATCM is discussed and explained. This chapter is intended to satisfy the requirements of Government Code section 11343.2, which requires that a noncontrolling "plain English" summary of the regulation be made available to the public.

## A. Overview of the ATCM

The proposed ATCM establishes requirements for new and in-use stationary CI engines. The requirements fall in three major categories: fuel-use requirements, operational requirements and emission standards, and recordkeeping and reporting requirements. In general, the fuel-use requirements and the recordkeeping and reporting requirements apply to all stationary CI engines and the operational requirements and emission standards only apply to stationary *diesel-fueled* CI engines[10].

Our approach in developing the operational requirements and emission standards for stationary diesel-fueled CI engines was to establish requirements and standards that are based on the application of the best available diesel PM control strategies for emergency standby and prime applications. Factors considered when establishing requirements included potential near-source risk, cost of controls, availability of U.S. EPA or ARB off-road certified engines that can meet the proposed stationary engine emission standards, and the availability of viable control technologies for stationary engine applications. This approach to developing requirements is reflected in the differing requirements for emergency standby and prime engines, and the establishment of specific exemptions.

The following subchapters discuss and explain the key requirements of the ATCM in more detail.

## B. Purpose

The purpose of this ATCM is to reduce diesel particulate matter (PM) emissions and the associated potential cancer risks from stationary diesel-fueled engines. Diesel PM emission reductions are needed to reduce the risk to people who live in the vicinity of these engines and to reduce the contribution these engines make toward the overall

[10] *There is a broad-based exception to the general fuel-use requirements. In-use stationary CI engines* that are not diesel-fueled, are not subject to the fuel-use requirements. See subchapter F for further discussion.

regional exposures to diesel PM. More specifically, the purpose of the ATCM is to 1) establish a record of where stationary CI engines are located, what fuel they use, and how they are operated; 2) require new and in-use stationary CI engines to meet specified fuel requirements, operating requirements, and emission standards; and 3) require non-diesel-fueled new and in-use stationary CI engines to meet specified fuel requirements.

## C. Applicability and Effective Date

The proposed ATCM establishes requirements that apply to any person who sells, offers for sale, leases, or purchases a stationary CI engine for use in California. Further, the proposed ATCM establishes emission limitations and operational requirements that apply to the owners and operators of stationary CI engines with a rated horsepower greater than 50.

The effective date of the ATCM is no later than 30 days after the approval of this subsection by the Office of Administrative Law and the adoption of the ATCM into Title 17 of the California Code of Regulations. After adoption, the requirements of the ATCM are required to be implemented and enforced by each air pollution control and air quality management district (district). Each district has the choice of either implementing and enforcing the ATCM or adopting its own rule that differs from the ATCM but is as stringent. If a district chooses to implement and enforce the requirements of this section, it must do so by no later than 120 days after the effective date. If the district chooses adopt its own rule, that rule must be implemented and enforced no later than six months after the effective date.

## D. Exemptions

The proposed ATCM identifies several specific engine applications that are exempt from all or part of the fuel use, operating requirements, emission standards, or recordkeeping and reporting requirements. In general, the exemptions are provided to address specific situations where the impact of the emissions on nearby receptor locations is considered minimal and it is not practical to comply with the requirements of the proposed ATCM due to high costs or technical issues associated with controlling diesel PM emissions. Table V-1 identifies each exempted category of engine and the terms of the exemption. The exemption numbers correspond to the exemption numbers found in section (c), Exemptions, of the ATCM.

## Table V-1: Summary of Exemptions

| Exempted Category | Terms of the Exemption |
|---|---|
| 1) Portable CI engines, on-road and off-road vehicle engines[11] | - non-stationary CI engines are exempt from all requirements |
| 2) Marine vessel engines[2] | - non-stationary CI engines are exempt from all requirements |
| 3) In-use stationary CI engines used in agricultural operations | - exempt from all requirements.<br>- on-going efforts to identify how to reduce emission |
| 4) New stationary CI engines used in agricultural operations | - Separate requirements/standards established for new agricultural engines. Exempt from operational requirements and emission standards for non-agricultural engines. |
| 5) Single cylinder cetane test engines | - exempt from operating requirements and emission standards. |
| 6) In-use stationary CI engines subject to requirements of *Risk Management Guidance, October 2000* | - exempt from operating requirements and emission standards if meet Risk Management Guidance requirements |
| 7) In-use emergency standby stationary CI engines at hospitals with approved OSHPD Plans that require engine replacement | - exempt from operating requirements and emission standards |
| 8) Stationary diesel-fueled CI engines used solely for the training of military personnel | - exempt from all the requirements except recordkeeping and reporting |
| 9) Stationary diesel-fueled engines operating on San Clemente and San Nicolas Islands | - exempt from all requirements except recordkeeping and reporting. |
| 10) Stationary diesel-fueled engines operating on outer continental shelf platforms | - exempt from operating requirements and emission standards |
| 11) In-use emergency standby stationary diesel-fueled CI engines used solely for the safe shutdown and maintenance of a nuclear facility when normal power service fails or is lost | - exempt from operating requirements and emission standards. |
| 12) In-use prime stationary diesel-fueled CI engine located beyond school boundaries that operates no more than 20 hours per year | - exempt from emission standards. |
| 13) In-use stationary dual-fueled diesel-pilot CI Engines that use an alternative diesel fuel or an alternative fuel | - exempt from all requirements except recordkeeping and reporting |
| 14) Stationary dual-fueled diesel-pilot CI engines that use digester gas or landfill gas | - exempt from all requirements except recordkeeping and reporting |
| 15) In-use stationary diesel-fueled CI engines that have selective catalytic reduction (SCR) systems | - exempt from all requirements except recordkeeping and reporting |
| 16) In-use emergency standby stationary diesel-fueled CI engines used as direct-drive fire pump engines | - exempt from emission standards and operating requirements |
| 17) Stationary diesel-fueled CI engines owned by NASA and used solely at space shuttle landing sites | - exempt from all the requirements except recordkeeping and reporting |

[11] Portable engines, on-road and off-road vehicles, and marine vessel engines will be addressed in other ATCMs.

In the following paragraphs, we discuss the rationale for establishing several of the exemptions.

Exemptions 3 and 4: Agricultural Engines

The proposed ATCM exempts in-use stationary CI engines used in agricultural operations (agricultural engines) from all requirements and establish a separate set of requirements for new agricultural engines which are presented in subchapter G.5. The reasons why in-use agricultural engines were not included in this ATCM are discussed in detail in Chapter X, Additional Considerations. In short, factors that influenced our decision to exempt in-use agricultural engines and define separate requirements for new agricultural engines included: 1) retrofit installation and availability issues unique to engines in agricultural service, and 2) implementation and enforcement constraints. Although in-use agricultural engines are currently exempt, ARB staff is continuing its efforts to determine how best to further reduce diesel PM emissions from these engines.

Exemption 6: Engines in Compliance with the *Risk Management Guidance for the Permitting of New Stationary Diesel-fueled Engines, October 2000 (Guidance)*

The proposed ATCM exempts in-use stationary diesel-fueled CI engines from the fuel requirements, emission standards, and operational requirements, if these engines are in compliance by January 1, 2005, with the requirements of the Guidance. The Guidance is a non-regulatory permitting guidance document to assist districts in making risk management decisions associated with the permitting of new stationary diesel-fueled CI engines. The requirements of the Guidance are summarized in the Table V-2.

## Table V-2: Summary of Recommended Permitting Requirements for New Stationary Diesel-Fueled Engines Defined in the *Risk Management Guidance*, October 2000

| | | | | Minimum Technology Requirements | | | Additional Requirements | |
|---|---|---|---|---|---|---|---|---|
| Engine Category | Annual Hours of Operation | Group | Performance Standard[1] (g/bhp-hr) | New Engine PM Emission Levels[1] (g/bhp-hr) | Fuel Technology Requirements | Add-On Control | HRA Required | SF Report |
| Emergency Standby > 50 hp | ≤ 100 hours[2] | 1 | 0.15 | 0.15 | CARB Diesel or Equivalent | No | No | No |
| All Other Engines > 50 hp | ≤ 400 hours | 1 | 0.02 | 0.15 | Very low-sulfur CARB Diesel or equivalent [4] | Catalyst-based DPF or equivalent | No | No |
| | > 400 hours | 2 | 0.02 | 0.15 | Very low-sulfur CARB Diesel or equivalent [4] | Catalyst-based DPF or equivalent | Yes | If HRA shows risk > 10/million |

HRA - Health Risk Assessment; SF - Specific Findings; DPF - Diesel Particulate Filter

1. ISO 8178 test procedure IAW *California Exhaust Emission Standards and Test Procedures for New 1996 and Later Off-Road Compression–Ignition Engines, May12, 1993.*
2. The annual hours of operation for emergency standby engines include the hours of operation for maintenance and testing runs only.
3. The Guidance only required very low sulfur (≤ 15 ppmw) CARB diesel or equivalent be used in areas where the district determines it is available in sufficient quantities and economically feasible to purchase. CARB diesel is required to be used in all other areas.

The performance standards and minimum technology requirements of the Guidance are consistent with the requirements of the ATCM. The requirement for a site-specific health risk assessment (HRA) is not specifically identified in the ATCM. We do not believe that a site-specific risk assessment is necessary in a most cases when a prime engine is meeting either 0.02 g/bhp-hr emission limit, or an 85 percent reduction from baseline levels. Our screening level risk analysis[12] estimates that risk from prime engines in compliance with the ATCM requirements will be below 10/million when operating 1000 hours year, which is approximately the average annual hours prime engines operate (Appendix C, Prime Stationary Diesel-Fueled Engine Survey). However, the ATCM does not preclude a district from requiring a site-specific HRA, should the anticipated hours of operation significantly exceed 1000 hours per year.

[12] The estimated cancer risks from engines meeting the requirements of the ATCM are based on the estimated diesel PM concentration at the point of maximum impact as determined using air dispersion modeling. See Appendix E, Stationary Diesel-Fueled Engines Health Risk Assessment, for a detailed discussion of how the estimated risk was determined and estimated risk values posed by engines of differing sizes and hours-of-operation.

Exemption 11: Emergency Standby Engines used solely for the safe shutdown and maintenance of a nuclear facility when normal power service fails or is lost.

Currently, there are two active nuclear power plants in California: 1) the Diablo Canyon Nuclear Power Plant, Avila Beach operated by the Pacific Gas and Electric Company (PG&E), and 2) the San Onofre Nuclear Generating Station, San Clemente, operated by the Southern California Edison Company. Both have emergency standby stationary diesel-fueled CI engines that provide power for the emergency core cooling and other vital functions for the safe shutdown of the nuclear power plant. These engines are generally large – around 3,000 horsepower. The six at Diablo Canyon are Alco Model 18-251 rated at 3,630 bhp. (PG&E, 2003) The eight at San Onofre are configured in tandem. Four pairs each consisting of a 2,879 bhp and 3,800 bhp engine. (San Diego, 2003) Based on emission test data from similar engines, the diesel PM emission rate for each engine is estimated to be in the 0.30 g-bhp-hr to 0.14 g/bhp-hr range (Fairbanks Morse, 2000). Operating records from both Nuclear Plants indicate that they have been able to operate at less than 150 hours per year for maintenance and testing purposes. The San Onofre Engines are permitted, and are limited to 200 hours of operation for maintenance and testing purposes. (SDCAPCD, 2003) The Diablo Canyon engines are currently exempt from permit requirements, however, the annual hours operated for maintenance and testing over the last three years ranged from 26 to 99 hours per engine. (PG&E, 2002) These engines are contained in hardened buildings and subject to stringent design and operational requirements.

The proposed ATCM allows each district APCO the authority to approve a Request for Exemption from the operational requirements and emission standards of the ATCM for any in-use emergency standby stationary diesel-fueled CI engine that is used solely for the safe shutdown and maintenance of a nuclear facility. The Request for Exemption may be approved for emergency standby engines that meet the following criteria:

- the engine is an emergency standby engine used solely for the safe shutdown and maintenance of nuclear facility when normal power service fails or is lost
- the engine is subject to the requirements of the Nuclear Regulatory Commission
- the engine is limited to 200 hours or less per year
- the district specifies any additional criteria that must be met. Additional criteria can include but is not limited to on-site reductions in diesel PM emissions from other diesel-fueled engines or vehicles operating at the nuclear facility, off-site reductions in diesel PM emissions from diesel-fueled engines or vehicles, and site-specific considerations that could be employed to minimize the impact of the engines diesel PM emissions.

These engines are given this exemption because they provide for the safe-shutdown of a nuclear facility and as such are subject to unique requirements (hardened buildings, Nuclear Regulatory Commission required failure mode analysis) that make retrofitting or replacing the engines extremely costly; there is an environmental benefit to there continued operation should they ever be called on in an emergency; and they are limited in the hours of operation which limits the potential diesel PM exposure resulting from there operation. (ARB, 2002) In addition, the districts have the authority to require the owners or operators to provide additional on-site or off-site reductions in diesel PM emissions should the risk from these engines exceed acceptable levels.

It should be noted that although the potential risk from one engine operating 200 hours per year is less than 10/million, the cumulative risk from all six or eight engines operating 200 hours per year at each facility may exceed district significant risk levels and be subject to additional requirements.

Exemption 12: Prime engines that operate no more than 20 hours per year

The proposed ATCM allows each district APCO the authority to approve a Request for Exemption from the emission standards of the ATCM for low-use prime engines operated outside of school boundaries. The Request for Exemption may be approved for prime engines that meet the following criteria:

- The district APCO must grant the delay in implementation in writing.
- The following conditions must be met:
  - the engine is a prime engine
  - the engine is located no more than 1000 feet from a school at all times
  - the engine operated no more than 20 hours per year cumulatively.

This exemption is being proposed in consideration of the potential risks from one engine and the significant cost to meet the requirements for prime engines. The health risk posed to receptors that are exposed to exhaust from these engines is estimated at less than 10 in a million at the point of maximum concentration given these engines operate for less than 20 hours cumulatively per year.[13] In addition, for an average size (700 horsepower) stationary diesel-fueled prime CI engine, the cost to retrofit or replace an engine to comply with the 85 percent reduction in PM emissions or the 0.01 g/bhp-hr diesel PM emission rate for compliance is estimated to range from $26,000 to $92,000.

Exemptions 13 and 14: Dual-fueled engines

The proposed ATCM exempts certain types of dual-fueled engines from the fuel requirements, operational requirements, and emission standards of the ATCM. A dual-fuel engine is any CI engine that is designed to operate on a combination of alternative fuel and conventional liquid fuel, such as gasoline or diesel. These engines have two separate fuel systems, which either inject both fuels simultaneously into the engine

[13] The estimated cancer risks from engines meeting the requirements of the ATCM are based on the estimated diesel PM concentration at the point of maximum impact as determined using air dispersion modeling. See Appendix E, Stationary Diesel-Fueled Engines Health Risk Assessment Methodology, for a detailed discussion of how the estimated risk was determined and estimated risk values posed by engines of differing sizes and hours-of-operation.

combustion chamber or fumigate the gaseous fuel with the intake air and inject the liquid fuel into the combustion chamber.

In-use dual-fueled diesel-pilot engines that use an alternative fuel or an alternative diesel fuel are exempt from the fuel requirements and emission standards of the ATCM. The term "diesel-pilot" refers to the use of a small amount of diesel fuel as an ignition source for an alternative fuel that would otherwise not combust, or combust incompletely, when used in a CI engine. The definition of "small amount" for purposes of this ATCM is 5 parts diesel fuel to 100 parts total fuel on an energy equivalent basis. The reasons why we chose to exempt them are listed below and discussed in detail in Chapter X, Additional Considerations.

- These engines represent an 85 percent reduction in diesel PM emissions from a 100 percent diesel-fueled CI engine.
- The emissions from these engines will be included in the facility-wide emission inventory/risk assessment requirements of AB 2588 ("Hot Spots" Program).
- Recordkeeping and reporting information is required. We will reevaluate the health risk posed by exposure to the exhaust of these engines at a later date.

All dual-fueled diesel-pilot engines that use digester gas or landfill gas are exempt from the fuel requirements, operational requirements, and emission standards of the ATCM. Digester gas is any gas derived from anaerobic decomposition of organic matter. Digester gas is produced at wastewater treatment plants. Landfill gas is any gas derived through any biological process from the decomposition of waste buried within a waste disposal site. The reasons why we chose to exempt dual-fueled diesel-pilot engines that use digester gas or landfill gas are listed below.

- The number of these engines is relatively small (less than 10)
- Digester gas and landfill gas is unconditioned and contains a compound called Siloxane. Siloxane, which is silicon based, clogs the catalyst beds of catalyzed emission control equipment. This reduces the availability of sites where the catalytic reaction can occur and ultimately renders the catalyst inoperable. It should be noted that installation of a pretreatment system to remove Siloxane prior to combustion in the engine is possible, and will allow a catalytic control system to operate on digester and landfill gases. However, the cost to install and maintain such a system is substantial and is the reason why these pretreatment systems are not currently operating anywhere in the country.
- There are environmental benefits to using digester or landfill gas that would otherwise be flared.
- Requiring recordkeeping and reporting information is required. We will reevaluate the health risk posed by exposure to the exhaust of these engines at a later date.

Exemption 15: In-Use Engines with SCR systems

The proposed ATCM exempts in-use stationary diesel-fueled engines that have installed selective catalytic reduction systems (SCR) from the emission limit and operating requirements. Currently, ARB staff is aware of only 12 stationary diesel-fueled CI engines with SCR systems installed. These engines are exempt because of the high costs and technical issues associated with installing diesel particulate matter control technologies on engines that already have SCR systems in place. For in-use engines with SCR systems currently installed additional cost would be associated with removing the SCR system to accommodate the installation of a DPF. The cost of installing an SCR system is significant. It can typically range from the $50 to $60/hp range, compared to about $40/hp for a DPF. (ARB, 2000) As a rule, DPFs should be installed prior to the SCR to avoid exposure to reductant slip and to facilitate the regeneration of the filter element through the exposure to high (300° C) exhaust temperatures. Although these engines are exempt from the emission standards and operating requirements of the proposed ATCM, they are still subject to local District regulations, rules, and policies. It is at that level that we believe it is most appropriate for diesel PM emission standards and operating requirements be developed for in-use engines with SCR systems.

Exemption 16: In-Use Stationary Diesel-Fueled CI Engines used as Direct-Drive Fire Pump Engines

In-use emergency fire pump assemblies that are driven directly by stationary diesel-fueled CI engines and are operated the hours necessary to comply with the testing requirements of NFPA 25, are not subject to the emission standards or operating requirements of the proposed ATCM. (NFPA25) Staff estimates this effects a very small fraction - less than one percent of the fire pump engine population. The NFPA 25 standard requires maintenance and testing operation from 29 to 34 hours per year. ARB staff is aware that this exceeds the 20 hour maximum set for uncontrolled engines, and may exceed the 30 hour maximum set for engines that meet the 0.40 g/bhp-hr standard, but this exemption is warranted because retrofitting these engines with emission control devices may compromise the Underwriters Laboratory (UL) certification of these engines, and replacement of these engines is likely to be cost prohibitive.

## E. Definitions

The proposed ATCM provides definitions of all terms that are not self-explanatory. All totaled, there a 54 definitions provided in the ATCM to help clarify and enforce the regulation requirements. In this subchapter, we discuss the definitions for the key terms used throughout this chapter.

1. CARB Diesel Fuel: CARB Diesel Fuel is any diesel fuel that meets the specifications defined in Title 13, California Code of Regulations, sections 2281-2282, and section 2284. These regulations set standards on

sulfur content, aromatic content, and fuel lubricity. These regulations s also allow producers and importers of diesel fuel to comply with the regulations by qualifying through testing alternative CARB diesel fuel formulations. Alternative CARB diesel fuel formulations could include diesel fuels that are mixtures of diesel fuel and alternative diesel fuels, e.g., biodiesel.

2. New Engine: A "new" engine is an engine that was installed at a facility after January 1, 2005. The term "new" is specifically defined in the proposed ATCM. In general, a new engine is one that was installed after January 1, 2005. It doesn't matter if it were never used before (i.e., "brand-new"), or is a previously used engine. If it is new to the facility, then it is required to meet the new engine emission standards and operational limits. There are specific exceptions to this general definition of a new engine. Temporary replacement engines are not considered new engines. Engines approved for installation prior to effective date of the ATCM, but not installed until after January 1, 2005, are not considered new. An engine that is one of four or more engines owned by a single owner and relocated prior to January 1, 2008, to an offsite location owned by the same owner or operator engine is not considered new. An engine used in agricultural operations and is relocated to an offsite location owned by the same owner or operator is not considered new. Engines that fall into these exception categories are considered to be in-use engines and are subject to in-use engine requirements.

   The proposed ATCM establishes a separate set of requirements for new stationary diesel-fueled CI engines used in agricultural operations. Prior to January 1, 2008, new engines that were originally funded under a State or federal incentive funding program, e.g., California's Carl Moyer Program or the U.S. Department of Agriculture's Environmental Quality Incentives Program (EQIP), are exempt from these requirements.

3. In-Use Engines: An "in-use engine" is one that was installed at a facility prior to or on January 1, 2005. It is defined in the ATCM as an engine that is not a new engine.

4. Stationary CI Engine: "Stationary CI Engine" means a CI engine, such as an electric power generator set, grinder, rock crusher, sand screener, crane, cement blower, air compressor, and water pump, that is it is physically attached to a foundation, or remains at the same stationary source for more than 12 consecutive rolling months or 365 rolling days, whichever occurs first. This 12 month/365 day time period does not include time spent in a storage facility at the facility. There is also a special provision for "seasonal sources". A seasonal source is a CI engine that operates for at least three consecutive or nonconsecutive months per year for at least two years. Seasonal source engines are considered stationary CI engines. If a CI engine is moved from one facility to another or one location to another location in the same facility

such that, under the totality of the circumstances, the district APCO determines the movement of the engine is an attempt to circumvent the 12 consecutive rolling month requirement discussed above, that engine is considered to be a stationary CI engine. This definition is consistent with the definition of portable equipment found in the ARB's Portable Equipment Registration Program (Title 13 CCR sections 2450-2466).

5. Maintenance and Testing: "Maintenance and testing" means operating an emergency standby engine during maintenance of the engine or the supported equipment; or operating the engine to test the engine's ability to perform during an emergency, or the supported equipment's ability to perform during an emergency. "Maintenance and testing" does not include testing to show compliance with this ATCM or other district policies, rules, or regulations. Compliance testing for showing compliance with the requirements of this ATCM is not limited. Hours of operation for demonstrating compliance with other District policies, rules, or regulations are left to district discretion.

6. Emergency standby engine: Emergency standby engines are used to provide electrical power or mechanical work in the event of an emergency. What constitutes an emergency is specifically defined in the ATCM. In general, an emergency is a power outage, fire, flood, or sewage overflow. An emergency also includes the failure of a facilities internal power distribution system. An example of this would be if a ski resort looses power to its ski lift operations due to a line failure at the resort.

7. Prime engine: Prime engines are defined in the ATCM as engines that are not emergency standby engines. Prime engines are used in a wide variety of applications, including compressors, cranes, generators, pumps (including agricultural pumps), and grinding/screening units.

### F. Fuel Use Requirements

The proposed ATCM specifies fuel use requirements and fuel additive requirements for all new stationary CI engines and all in-use stationary diesel-fueled CI engines. The fact that the term "diesel-fueled" is missing when defining the universe of 'new" engines affected by these requirements is not an oversight. Our policy is to hold all new stationary CI engines to the most stringent standards. This means all new CI engines, not just new diesel-fueled CI engines, must use fuels that meet the requirements identified in the ATCM. Conversely, in-use stationary CI engines that currently use non-diesel fuels are not subject to the fuel-use requirements. ARB staff considers the continued use of a non-diesel fuel to represent an appropriate fuel-use requirement for an in-use stationary CI engine.

The proposed ATCM requires all new stationary CI engines and all in-use stationary diesel-fueled engines to use either:

- CARB Diesel Fuel
- An alternative diesel fuel that meets the requirements of the Verification Procedure (which includes a multimedia impact assessment.)
- An alternative fuel (e.g., CNG, LPG)
- CARB diesel fuel used with a fuel additive that meets the requirements of the Verification Procedure
- Any combination of the above

As with all requirements, there are exemptions to the fuel and fuel additive requirements. These exemptions are identified in subchapter D and address non-stationary engines, in-use stationary CI engines used in agricultural operations, cetane test engines, specific types of military training engines, engines operating on San Clemente or San Nicolas Islands, engines operating on OCS platforms, and certain stationary dual-fueled diesel-pilot CI engines, and stationary engines owned by NASA and operating at space shuttle landing sites.

## G. Operating Requirements and Emission Standards

This subchapter is comprised of six parts. Parts 1 and 2 summarize the operating requirements and emission standards for emergency standby stationary diesel-fueled CI engines with a rated horsepower greater than 50. Parts 3 and 4 summarize the operating requirements and emission standards for prime stationary diesel-fueled engines with a rated horsepower greater than 50. Part 5 summarizes the emission standards for new stationary diesel-fueled CI engines used in agricultural operations with a rated horsepower greater than 50. Part 6 summarizes the emission standards for new stationary diesel-fueled CI engines with a rated horsepower less than or equal to than 50.

This chapter does not discuss the basis for the emission standards and operating requirements. For a detailed discussion of the reasons why the emission standards and operational limits are defined in the ATCM as they are, see Appendix F, Basis for the Standards.

### 1. Operating Requirements and Emission Standards for New Emergency Standby Stationary Diesel-Fueled CI Engines with a Rated Horsepower Greater than 50

General Operating Requirements and Emission Standards

The emission standards, operational requirements, and compliance dates for new emergency standby diesel-fueled CI engines are summarized in Table V-3.

## Table V-3: Diesel PM Standards and Operational Requirements for New Emergency Standby Stationary Diesel-Fueled Engines

| Diesel PM Standards (g/bhp-hr) | NMHC/NOx/ CO Standards (g/bhp-hr) | Maximum Allowable Annual Hours of Operation for Engines Meeting Diesel PM Limit | | | Compliance Dates |
|---|---|---|---|---|---|
| | | Emergency Use | Non-Emergency Use | | |
| | | | Emission Testing to show compliance[2] | Maint. & Testing (hours/year) | |
| ≤ 0.15[1] | Off-road Standard (Appropriate or Tier 1) | Not Limited by ATCM[3] | Not Limited by ATCM[3] | 50 | January 1, 2005 |
| ≤ 0.01[1] | | Not Limited by ATCM[3] | Not Limited by ATCM[3] | District Discretion but may not exceed 100 | |

1. Or off-road certification standard (title 13 CCR section 2423) for an off-road engine with the same horsepower rating, whichever is more stringent
2. Emission testing limited to testing to show compliance with subsections (e)(2)(A)(ii).
3. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.

The proposed ATCM establishes requirements for both the sellers and operators of new stationary diesel-fueled engines. As shown in Table V-3, the proposed ATCM establishes diesel PM emission standards that become more stringent as the maximum allowable annual hours for maintenance and testing increase. Persons selling purchasing or leasing new emergency standby stationary diesel-fueled CI engines are required to meet the emission standards summarized in Table V-3. Engines that operate less than of equal to 50 hours per year for maintenance and testing purposes are required meet a diesel PM emission limit of 0.15 g/bhp-hr, or the off-road certification standard (title 13 CCR section 2423) for an off-road engine with the same horsepower rating, whichever is more stringent. If an owner or operator needs to operate his or her engine more than 50 hours per year for maintenance and testing purposes, the District will determine the emission standards and operating requirements for that engine on a site-specific basis with the following restrictions. In no case shall the diesel PM emission rate of the engine be greater than 0.01 g/bhp-hr and in no case shall the total number of annual hours of operation for maintenance and testing purposes exceed 100. The criteria to be considered by the District when making this decision include the NOx emission rate of the engine, the existence of additional diesel-fueled engines operating on-site, and current and planned use of surrounding land.

The proposed ATCM also requires all new stationary diesel-fueled CI engines to meet the appropriate off-road standard for HC, NOx, or NMHC+NOx, and CO, as defined in Title 13 CCR section 2423. For example, if the new stationary diesel-fueled CI engine has a rated brake horsepower (hp) of 250 hp and is a 2003 model year engine, then the appropriate off-road standards would 4.9 g/bhp-hr for NMHC+NOx, and 2.6 g/bhp-hr for CO (also referred to as Tier II standards). Similarly, if the new engine is an older model, lets say a 250 hp, model year 1997, then the appropriate off-road standard would be 1.0 g/bhp-hr for HC, 6.9 g/bhp-hr for NOx, and 8.5 g/bhp-hr for CO (also referred to as

Tier I standards). If the engine pre-dates the off-road standards, for example a 1987 model year engine, the appropriate standard would default to the Tier I standard for the horsepower rating category of the engine. For the greater than 50 hp to less than 175 hp category of engines, the Tier I standard defines emission standards for NOx only. For these engines, there would be no emission standards for HC or CO.

The proposed ATCM does not limit the number of hours of emergency use operation. As discussed in Appendix F, Basis for the Standards, the number of hours for emergency use operation for a typical emergency standby engine is relatively small when compared to the hours of operation for maintenance and testing. This, coupled with the fact that the owner or operator can directly control the number of hours of operation for maintenance and testing, led us to establishing upper limits for maintenance and testing hours only.

The ATCM does not limit the number of hours of operation for ATCM compliance testing. ATCM compliance testing is a one-time event and is only required when emission test data is not already available. See subchapter I, Emissions Data, for a discussion on the types of information that can be submitted to the district APCO to show compliance with the emission standards of the ATCM.

The proposed ATCM does not establish any ongoing testing requirements for purposes of enforcement of the requirements beyond initial compliance testing. Ongoing compliance is left to each individual District. However, to facilitate a District's ongoing compliance program, the proposed ATCM does require ongoing recordkeeping and reporting requirements as well as the monitoring equipment requirements (see subchapter H, Reporting, Notification, Recordkeeping, and Monitoring Requirements).

Interruptible Service Contract Engines

An interruptible service contract (ISC) is a voluntary arrangement between a non-residential electrical customer and an electrical service provider where the customer agrees to reduce its electrical consumption during periods of peak demand in exchange for compensation. Currently, the proposed ATCM classifies a new engine used to provide power in a "non-emergency" situation, e.g., the fulfillment of an ISC contract, as a new prime engine, not an emergency standby engine, and is subject to the new prime engine emission standards discussed in subchapters G(3) and G(4). Some stationary diesel-fueled engine owners under existing ISC contracts argued that the current approach sets emission standards that are too stringent, given that ISC contracts help prevent blackouts which could result in widespread use of diesel-fueled engines during a blackout. Others argued against easing the current approach, raising concerns about the potential for elevated near source exposures to diesel PM from ISC engines. ARB staff will continue to meet and confer on this issue and may provide a modified proposal to the Board at the November 13-14, 2003 hearing.

District's Authority to Establish More Stringent Standards and Allow Additional Hours of Operation

The ATCM clarifies that the district Air Pollution Control Officer (APCO) has the authority to establish more stringent emission standards and operating requirements, and to allow additional hours of operation for demonstrating compliance with other District rules, Verification testing, and initial start-up testing.

The authority to establish more stringent emission standards and operating requirements is consistent with the requirements of Health and Safety Code section 39666 (d), which gives the district the authority to adopt a rule that is as stringent or more stringent than the ATCM.

We also believe that it is necessary to grant districts the authority to allow emergency standby engines to operate for other specific purposes. In discussions with District representatives, we concluded that emergency standby engines may be required to operate for emission testing purposes to show compliance with existing internal combustion engine rules. It has also come to our attention that several control equipment manufacturers wish to verify their emission reduction claims by emission testing emergency standby stationary engines equipped with their control technologies. Further, newly installed emergency standby engines may be required to operate after initial installation to ensure proper performance of the engine and supported equipment. District Air Pollution Control Officers are best suited to make site specific decisions as to the number of hours an engine should be run for demonstrating compliance with other District rules, Verification testing, or initial start-up testing.

**2. Operating requirements and Emission Standards for In-Use Emergency Standby Stationary Diesel-Fueled CI Engines with a rated horsepower greater than 50**

General Operating Requirements and Emission Standards

The emission standards and operating requirements for in-use emergency standby diesel-fueled CI engines are summarized in Table V-4.

### Table V-4: Diesel PM Standards and Operational Requirements for In-Use Emergency Standby Stationary Diesel-Fueled Engines

<table>
<tr><th rowspan="3">Diesel PM Standards (g/bhp-hr)</th><th rowspan="3">NMHC/NOx/CO Standards (g/bhp-hr)</th><th colspan="3">Maximum Allowable Annual Hours of Operation for Engines Meeting Diesel PM Limit</th><th colspan="2">Compliance Dates by Model Year of Engine</th></tr>
<tr><th rowspan="2">Emergency Use</th><th colspan="2">Non-Emergency Use</th><th rowspan="2">Owns 3 or Fewer Engines</th><th rowspan="2">Owns 4 or More Engines</th></tr>
<tr><th>Emission Testing to show compliance[1]</th><th>Maint. & Testing (hours/year)</th></tr>
<tr><td>Not Limited by ATCM[2]</td><td rowspan="4">If control strategy is not Verified retrofit technology, show no increase from baseline levels</td><td>Not Limited by ATCM[2]</td><td>Not Limited by ATCM[2]</td><td>20</td><td rowspan="4">Pre-89 thru 89<br>1/1/2006<br><br>90 to 96<br>1/1/2007<br><br>96 thru POST- 96<br>1/1/2008</td><td rowspan="4">Pre-89 thru 89<br>25% 1/1/06<br>50% 1/1/07<br>75% 1/1/08<br>100% 1/1/09<br><br>90 to 96<br>30% 1/1/07<br>60% 1/1/08<br>100% 1/1/09<br><br>96 thru POST- 96<br>50% 1/1/08<br>100% 1/1/09</td></tr>
<tr><td>≤ 0.40</td><td>Not Limited by ATCM[2]</td><td>Not Limited by ATCM[2]</td><td>30</td></tr>
<tr><td>≤ 0.15</td><td>Not Limited by ATCM[2]</td><td>Not Limited by ATCM[2]</td><td>District Discretion but may not exceed 50</td></tr>
<tr><td>≤ 0.01</td><td>Not Limited by ATCM[2]</td><td>Not Limited by ATCM[2]</td><td>District Discretion but may not exceed 100</td></tr>
</table>

1. Emission testing limited to testing to show compliance with subsections (e)(2)(A)(ii).
2. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.

As with new emergency standby stationary diesel-fueled CI engines, the ATCM establishes diesel PM emission standards that become more stringent as the maximum allowable annual hours for maintenance and testing increase. The owners or operators of in-use stationary diesel-fueled CI engines are required to comply with these emission and operational limits. Engines that operate less than or equal to 20 hours per year for maintenance and testing purposes are not required by the proposed ATCM to meet a diesel PM emission limit. Engines that operate more than 20, but less than or equal to 30 hours per year for maintenance and testing purposes are required to meet a diesel PM emission limit of 0.40 g/bhp-hr. The proposed ATCM is structured to limit maintenance and testing operation at 30 hours per year for most engines, based on staff's belief that the majority of engines do not require more hours to ensure reliability. However, if an owner or operator needs to operate his or her engine more than 30 hours per year for maintenance and testing purposes, the proposed ATCM allows the District to establish the emission standards and operating requirements for that engine on a site-specific basis with the following restrictions. If the owner or operator needs more than 30 hours per year, but less than or equal to 50 hours per year for maintenance and testing purposes, the diesel PM emission rate of that engine may not exceed 0.15 g/bhp-hr. If the owner or operator needs more than 50 hours per year, but less than or equal to 100 hours per year for maintenance and testing purposes, the diesel PM emission rate of that engine may not exceed 0.01 g/bhp-hr. The criteria to be considered by the District when making this decision include the site-specific potential cancer risk, the NOx emission rate of the engine, the existence of additional diesel-fueled engines operating on-site, and current and planned use of surrounding land.

ARB staff estimates that an engine that meets the requirements of the ATCM as summarized in Table V-4, and operates the typical number of hours for emergency use, will result in a maximum offsite cancer risk that is below district-defined significant risk levels. See Appendix F, Basis for the Standards, for a more detailed discussion on potential offsite cancer risk. For those site-specific situations where the potential risk may warrant further evaluation, such as facilities with multiple engines, the ATCM provides the District with the authority to establish more stringent standards.

The proposed ATCM establishes HC, NOx, or NMHC +NOx, and CO standards for in-use emergency standby stationary diesel-fueled CI engines that use diesel PM control technologies that are not verified through the ARB's Verification Procedure. For technologies that have been verified through ARB's Verification Procedure, these standards are unnecessary because the Verification Procedure requires limits at least as stringent as these be met. For unverified control technologies, the ATCM limits any increase in the emission rate of HC or NOx emissions to less than or equal to 10 percent from baseline levels. The 10 percent increase is allowed to take into account the uncertainty of the test methods. An option to meeting the separate HC and NOx standards is to meet a combined NMHC+NOx limit. The ATCM does not allow any increase in the sum of NMHC and NOx from baseline levels. For CO, the ATCM limits the increase in CO emissions from implementing a non-verified control strategy to less than or equal to 10 percent from baseline levels. The underlying goal of these standards is to not increase the emissions of other criteria pollutants when implementing control strategies that reduce diesel PM emissions.

<u>In-Use Stationary Diesel-Fueled Engines: Compliance Schedule</u>

*Schedule for Engines that Meet Requirements with Hour Limitations*

Each owner or operator of an in-use emergency standby stationary diesel-fueled engine that can meet the emission standards and operating requirements discussed above by solely maintaining or reducing the current annual hours of operation for maintenance and testing, shall maintain engine usage records to show compliance beginning with the January 1, 2005, to December 1, 2006, period and continuing every year thereafter.

*Schedule for Engines that Meet Requirements by Reducing Emission Rates*

Each owner or operator of three or less in-use emergency standby stationary diesel-fueled engine must meet the operating requirements and emission standards discussed above in accordance with the following schedule:

- All 1989 model year engines and pre-1989 model year engines must be in compliance by no later than January 1, 2006.

- All 1990 model year and post-1990 model year engines, to pre-1996 model year engines must be in compliance by no later than January 1, 2007.

- All 1996 model year engines and post-1996 model year engines must be in compliance by no later than January 1, 2008.

Each owner or operator of four or more in-use emergency standby stationary diesel-fueled engine engines is afforded more time to come into compliance with the above requirements.

**1989 and Pre-1989 Model Year Engines**

| Percent of Engines | Compliance date |
|---|---|
| 25% | January 1, 2006 |
| 50% | January 1, 2007 |
| 75% | January 1, 2008 |
| 100% | January 1, 2009 |

**1990, Post-1990 through Pre-1996 Model Year Engines**

| Percent of Engines | Compliance date |
|---|---|
| 30% | January 1, 2007 |
| 60% | January 1, 2008 |
| 100% | January 1, 2009 |

**1996 and Post-1996 Model Year Engines**

| Percent of Engines | Compliance date |
|---|---|
| 50% | January 1, 2008 |
| 100% | January 1, 2009 |

Prior to the earliest applicable compliance date, the owner operator must provide the District APCO with emissions data for the purposes of demonstrating compliance. The types of emissions data that are acceptable for showing compliance are discussed in more detail in section I.

Interruptible Service Contracts

As with new emergency standby stationary diesel-fueled engines, a new engine used to provide power in a "non-emergency" situation, e.g., the fulfillment of an ISC contract, is classified as a new prime engine, not an emergency standby engine, and is subject to the new prime engine emission standards discussed in subchapters G(3) and G(4). This approach is currently being reevaluated by ARB staff. Modifications to this approach may be presented at the November 13-14, 2003, Board hearing.

District's Authority to Establish More Stringent Standards and Allow Additional Hours of Operation

As with new emergency standby stationary diesel-fueled CI engines, the ATCM grant's the district Air Pollution Control Officer (APCO) the authority to establish more stringent emission standards and operating requirements, and to allow additional hours of operation for demonstrating compliance with other District rules, Verification testing, and initial start-up testing.

### 3. Operating Requirements and Emission Standards for New Prime Stationary Diesel-Fueled CI Engines with a Rated Horsepower Greater Than 50

General Operating Requirements and Emission Standards

The emission standards for new prime stationary diesel-fueled CI engines are summarized in Table V-5.

**Table V-5: Diesel PM Standards and Operational Requirements for New Prime Stationary Diesel-Fueled Engines**

| DIESEL PM Standards (g/bhp-hr) | NMHC/NOx/CO Standards (g/bhp-hr) | Maximum Allowable Annual Hours of Operation for Engines Meeting Diesel PM Standard | Compliance Dates |
|---|---|---|---|
| $\leq 0.01$[1] | Off-road Standard (Appropriate or Tier 1) | Not Limited by ATCM[2] | January 1, 2005 |

1. Or off-road certification standard (title 13 CCR section 2423) for an off-road engine with the same horsepower rating, whichever is more stringent
2. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.

The proposed ATCM establishes requirements for both the sellers and owners of new prime stationary diesel-fueled CI engines. These requirements go into effect January 1, 2005. The proposed ATCM requires all new prime stationary diesel-fueled CI engines to emit diesel PM at a rate of 0.01 g/bhp-hr or less, or meet the current applicable off-road certification standard for an off-road engine of the same horsepower rating.

As with new emergency standby stationary engines, the ATCM also requires all new prime stationary diesel-fueled CI engines to meet the appropriate off-road standards for HC, NOx, or NMHC+NOx, and CO, as defined in Title 13 CCR section 2423. If the engine pre-dates the off-road standards, for example a 1987 model year engine, the appropriate standard would default to the Tier I standard for the horsepower rating category of the engine.

More Stringent Standards for New Prime Stationary Diesel-Fueled Engines that Produce Electricity Near the Place of Use (Distributed Generation) Currently Eliminate Diesel-Fueled Engines as an Option for Prime Power Generation

Senate Bill 1298 (SB 1298), which was chaptered in September 2000, required the ARB to adopt emission standards and establish a certification program for electrical generation technologies that are exempt from air pollution control or air quality management district permit requirements. SB 1298 focused on electrical generation that is near the place of use and defined these sources as "distributed generation". The ARB also developed guidance to the air districts on the permitting or certification of electrical generation technologies that are subject to district permit.

As a result, new prime stationary diesel-fueled CI engines that are "well controlled" and are used as distributed generations sources will not meet the emission standards defined in the certification regulation. However, these "well-controlled" engines may meet District permitting program requirements, which are less stringent, if those programs are based on the ARB's Guidance for the Permitting of Electrical Generation Technologies. A "well-controlled" new diesel-fueled engine would be the equivalent of a Tier 3 off-road certified engine with an 85 percent reduction in diesel PM emissions (based on the installation of a diesel particulate filter (DPF)) and a 95 percent reduction in NOx emissions (based on the installation of a selective catalyst reduction (SCR) system). The resultant diesel PM and NOx emission levels of a well-controlled diesel-fueled CI engine are estimated at ranging from 0.02 g/bhp-hr (0.06 lb/MW-hr) to 0.03 g/bhp-hr (0.09 lb./MW-hr) for diesel PM and from 0.14 g/bhp-hr (0.41 lb/MW-hr) to 0.23 g/bhp-hr (0.67 lb./MW-hr) for NOx. Although these reductions are theoretically possible, installing both control technologies on one engine may result in less than optimum reduction in diesel PM. Factors that could reduce the reduction efficiency of a DPF that is installed in back of an SCR in the exhaust stream of a diesel-fueled engine include reduced inlet temperature and reductant slip.

The following paragraphs summarize the requirements of both the certification regulation and the guidance.

DG Certification Regulation Requirements

- Distributed generation sources must be certified by the ARB before they can be sold in California *if they are exempt from district permit requirements.*
- The DG Certification emission standards for 2003 and 2007 are summarized below.

Table V-6: January 1, 2003 Emission Standards

| Pollutant | DG Unit not Integrated with Combined Heat and Power | DG Unit Integrated with Combined Heat and Power |
|---|---|---|
| NOx | 0.5 lb/MW-hr (0.17 g/bhp-hr) | 0.7 lb/MW-hr (0.24 g/bhp-hr) |
| CO | 6.0 lb/MW-hr (2.0 g/bhp-hr) | 6.0 lb/MW-hr (2.0 g/bhp-hr) |
| VOCs | 1.0 lb/MW-hr (.34 g/bhp-hr) | 1.0 lb/MW-hr (0.34 g/bhp-hr) |
| PM | An emission limit corresponding to natural gas with fuel sulfur content no more than 1 grain/100scf | An emission limit corresponding to natural gas with fuel sulfur content no more than 1 grain/100scf |

Table V-7: January 1, 2007 Emission Standards

| Pollutant | All DG Units |
|---|---|
| NOx | 0.07 lb/MW-hr (.02 g/bhp-hr) |
| CO | 0.10 lb/MW-hr (.03 g/bhp-hr) |
| VOCs | 0.02 lb/MW-hr (.007 g/bhp-hr) |
| PM | An emission limit corresponding to natural gas with fuel sulfur content no more than 1 grain/100scf |

The above standards are not currently achievable by diesel-fueled CI engine technology.

DG Guidance Document

The ARB developed guidance for electrical generation technologies *that are subject* to district permits. These technologies included reciprocating engines. The purpose of the guidance is to assist the air districts in making permitting decisions for electrical generation technologies that are subject to district permits. The guidance includes recommended Best Available Control Technology (BACT) levels and suggested permit conditions

Table V-8 summarizes the BACT recommendations for Reciprocating Engines used in Distributed Generation Applications.

**Table V-8: Summary of BACT for the Control of Emissions from Reciprocating Engines Used in Electrical Generation**

| Equipment Category | NOx lb/MW-hr | VOC lb/MW-hr | CO lb/MW-hr | PM lb/MW-hr |
|---|---|---|---|---|
| Fossil fuel fired | 0.5 (0.15 g/bhp-hr or 9 ppmvd*) | 0.5 (0.15 g/bhp-hr or 25 ppmvd*) | 1.9 (0.6 g/bhp-hr or 56 ppmvd*) | 0.06 (0.02 g/bhp-hr) |

* lb/MW-hr standard is equivalent to g/bhp-hr and ppmvd expressed at 15 percent $O_2$. Concentration (ppmvd) values are approximate.

### 4. Operating Requirements and Emission Standards for In-Use Prime Stationary Diesel-Fueled CI Engines with a rated horsepower greater than 50

General Operating Requirements and Emission Standards

The emission standards for in-use prime stationary diesel-fueled CI engines are summarized in Table V-9.

**Table V-9: Diesel PM Standards and Operational Requirements for In-Use Prime Stationary Diesel-Fueled Engines**

<table>
<tr><th colspan="2">Diesel PM Standards<br>(g/bhp-hr)</th><th rowspan="2">NMHC/NOx/CO Standards<br>(g/bhp-hr)</th><th rowspan="2">Maximum Allowable Annual Hours of Operation for Engines Meeting Diesel PM Standard</th><th colspan="2">Compliance Dates by Model Year of Engine</th></tr>
<tr><th>Applicability</th><th>Limit</th><th>Owns 3 or Fewer Engines</th><th>Owns 4 or More Engines</th></tr>
<tr><td>All Engines</td><td>85% reduction from baseline levels (Option 1)<br><br>or<br><br>0.01 g/bhp-hr [1] (Option 2)</td><td rowspan="2">If control strategy is not Verified retrofit technology, show no increase from baseline levels</td><td rowspan="2">Not Limited by ATCM[2]</td><td><u>Pre-89 thru 89</u><br>1/1/2006<br><br><u>90 to 96</u><br>1/1/2007<br><br><u>96 thru POST- 96</u><br>1/1/2008</td><td><u>Pre-89 thru 89</u><br>25% 1/1/06<br>50% 1/1/07<br>75% 1/1/08<br>100% 1/1/09<br><br><u>90 to 96</u><br>30% 1/1/07<br>60% 1/1/08<br>100% 1/1/09<br><br><u>96 thru POST- 96</u><br>50% 1/1/08<br>100% 1/1/09</td></tr>
<tr><td>Uncertified Engines</td><td>30% from baseline and meet 0.01 g/bhp-hr by July 1, 2011 (Option 3)</td><td colspan="2">All Model Years<br>- 30% reduction from baseline levels by January 1, 2006<br>- Meet 0.01 g/bhp-hr by July 1, 2011</td></tr>
</table>

1. Or off-road certification standard (title 13 CCR section 2423) for an off-road engine with the same horsepower rating, whichever is more stringent
2. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.

The proposed ATCM requires each in-use prime stationary diesel-fueled CI engine that is NOT certified to the Off-Road Compression Ignition Engine Standards (Title 13, CCR section 2423) to either

Option 1) reduce its diesel PM emission rate by 85 percent from baseline levels; or

Option 2) emit diesel PM at a rate of 0.01 g/bhp-hr or less, or meet the current applicable off-road certification standard for off-road engines of the same horsepower, whichever is more stringent; or

Option 3) reduce its diesel PM emission rate by at least 30 percent from baseline levels, by no later than January 1, 2006, and emit diesel PM at a rate of 0.01 g/bhp-hr or less by no later than July 1, 2011.

In-use prime stationary diesel-fueled CI engines that are certified to the Off-Road Compression Ignition Engine Standards must comply with either Option 1 or Option 2, above.

Baseline level is defined as the emission level of a diesel-fueled CI engine using CARB diesel fuel as configured upon initial installation or by January 1, 2003, whichever is later. The purpose of setting the baseline as some point in the past as opposed to the effective date of the ATCM, was to avoid providing a disincentive to an owner from reducing diesel PM emissions well prior to the compliance date for the engine. Additional guidance that owners or operators can use when defining the baseline diesel PM emission levels can be found in Appendix I, Determination of Baseline Levels.

As with new emergency standby stationary diesel-fueled CI engines, the ATCM establishes HC, NOx, or NMHC +NOx, and CO standards for in-use emergency standby stationary diesel-fueled CI engines that use diesel PM control technologies that are not verified through the ARB's Verification Procedure. For unverified control technologies, the ATCM limits any increase in the emission rate of HC or NOx emissions to less than or equal to 10 percent from baseline levels. An option to meeting the separate HC and NOx standards is to meet a combined NMHC+NOx limit. The ATCM does not allow any increase in the sum of NMHC and NOx from baseline levels. For CO, the ATCM limits the increase in CO emissions from implementing a non-verified control strategy to less than or equal to 10 percent from baseline levels. The underlying goal of these standards is to not increase the emissions of other criteria pollutants when implementing control strategies that reduce diesel PM emissions.

*Schedule for Engines that Meet Requirements by Complying with Option 1 or Option 2*

Each owner or operator of three or less in-use emergency standby stationary diesel-fueled engine must meet the operating requirements and emission standards discussed above in accordance with the following schedule

- All 1989 model year engines and pre-1989 model year engines must be in compliance by no later than January 1, 2006.
- All 1990 model year and post-1990 model year engines, to pre-1996 model year engines must be in compliance by no later than January 1, 2007.
- All 1996 model year engines and post-1996 model year engines must be in compliance by no later than January 1, 2008.

Each owner or operator of four or more in-use emergency standby stationary diesel-fueled engine engines is afforded more time to come into compliance with the above requirements.

**1989 and Pre-1989 Model Year Engines**

| Percent of Engines | Compliance date |
|---|---|
| 25% | January 1, 2006 |
| 50% | January 1, 2007 |
| 75% | January 1, 2008 |
| 100% | January 1, 2009 |

***1990, Post-1990 through Pre-1996* Model Year Engines**

| Percent of Engines | Compliance date |
|---|---|
| 30% | January 1, 2007 |
| 60% | January 1, 2008 |
| 100% | January 1, 2009 |

**1996 and Post-1996 Model Year Engines**

| Percent of Engines | Compliance date |
|---|---|
| 50% | January 1, 2008 |
| 100% | January 1, 2009 |

*Prior to the earliest applicable compliance date for Option 1, 2, or 3, the owner operator* must provide the District APCO with emissions data for the purposes of demonstrating compliance. The types of emissions data that are acceptable for showing compliance are discussed in more detail in subsection I.

District's Authority to Establish More Stringent Standards and Allow Additional Hours of Operation

As with new emergency standby stationary diesel-fueled CI engines, the ATCM grant's the district Air Pollution Control Officer (APCO) the authority to establish more stringent emission standards and operating requirements, and to allow additional hours of *operation for demonstrating compliance with other District rules, Verification testing, and* initial start-up testing.

**5. Operating Requirements and Emission Standards for New Stationary Diesel-Fueled CI Engines Used in Agricultural Operations with a rated horsepower greater than 50**

General Operating Requirements and Emission Standards

The emission standards and operational requirements for new stationary diesel-fueled CI engines used in agricultural operations (new agricultural engines) are summarized in Table V-10.

**Table V-10: Diesel PM Standards and Operational Requirements for New Agricultural Engines**

| **Diesel PM Standards** (g/bhp-hr) | **NMHC/NOx/CO Standards** (g/bhp-hr) | **Maximum Allowable Annual Hours of Operation for Engines Meeting Diesel PM Limit** | **Compliance Dates** |
|---|---|---|---|
| $\leq$0.15[1] | Off-road Standard | Not Limited by ATCM[2] | January 1, 2005 |

1. Or off-road certification standard (title 13 CCR section 2423) for an off-road engine with the same horsepower rating, whichever is more stringent
2. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.

The proposed ATCM establishes requirements for both the sellers and owners of new stationary diesel-fueled CI engines used in agricultural operations. These requirements go into effect January 1, 2005. The proposed ATCM requires all new agricultural engines to emit diesel PM at a rate of 0.15 g/bhp-hr or less, or meet the current applicable off-road certification standard for an off-road engine of the same horsepower rating. Both prime and emergency standby must meet the same emission limit. Emergency standby engines used in agricultural operations are not limited in their hours of operation.

As with new non-agricultural stationary diesel-fueled stationary CI engines, the ATCM requires new agricultural engines to meet the appropriate model year HC, NOx (or NMHC + NOx) and CO Off-Road Compression Ignition Engine Standards, as defined in Title 13 CCR section 2423. If the engine pre-dates the off-road certification standards, for example a 200hp engine manufactured in 1995, the agricultural engine would not be required to meet a HC, NOx (or NMHC+NOx) or CO emission limit.

<u>Basis for Separate Standards</u>

The proposed ATCM establishes separate emission standards for new agricultural engines. See section D, Exemptions, for a detailed discussion on why these separate emission standards were established.

<u>Carl Moyer/EQIP Engines</u>

The Carl Moyer Memorial Air Quality Standards Attainment Program provides funds on an incentive-basis for the incremental cost of cleaner than required engines and equipment. Eligible projects include cleaner on-road, off-road, marine, locomotive and stationary agricultural pump engines, as well as forklifts, airport ground support equipment, and auxiliary power units. The program's primary goal is to achieve near-term reductions in emissions of oxides of nitrogen (NOx), which are necessary for California to meet its clean air commitments under the State Implementation Plan. In addition, local air districts use these NOx emission reductions to meet commitments in their conformity plans, thus preventing the loss of federal funding for local areas throughout California. A secondary goal of the program is the reduction of particulate matter (PM) emissions. Many of the stationary agricultural pump engines that were replaced as part of the Carl Moyer Program, were replaced with engines that significantly reduced both NOx and diesel PM emissions.

The Environmental Quality Incentives Program (EQIP) was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land. The program provides funds for the purchase of low-emitting diesel-fueled engines.

Prior to January 1, 2008, the ATCM allows new agricultural engines that were purchased with Carl Moyer and EQIP funds to be exempt from the emission standards discussed in this section as long as they meet Tier II Off-Road Compression Ignition Standards for the horsepower category of the engine. The Tier II standards are found in Title 13, CCR section 2423).

### 6. Emission Standards for New Stationary Diesel-Fueled CI Engines with a rated horsepower less than or equal to 50

General Emission Standards

The emission standards for new stationary diesel-fueled CI engines with a rated horsepower less than or equal to 50 are summarized in Table V-11.

**Table V-11: Diesel PM Standards and Operational Requirements for New Stationary Diesel-Fueled Engines ≤ 50 HP**

| Diesel PM Standards (g/bhp-hr) | NMHC/NOx/CO Standards (g/bhp-hr) | Maximum Allowable Annual Hours of Operation for Engines Meeting Diesel PM Limit | Compliance Dates |
|---|---|---|---|
| Off-road Standard | Off-road Standard | Not Limited by ATCM [1] | January 1, 2005 |

1. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.

The proposed ATCM establishes requirements for sellers of new stationary diesel-fueled CI engines with a rated horsepower less than or equal to 50. These requirements go into effect January 1, 2005. The proposed ATCM requires all new stationary diesel-fueled CI engines with a rated horsepower less than or equal to 50 meet the current applicable off-road certification standard for an off-road engine of the same horsepower rating.

## H. Reporting, Notification, Recordkeeping, and Monitoring Requirements

### 1. Reporting Requirements

The purpose of the reporting requirements are to establish an accurate inventory of stationary CI engines currently operating in California. The information that is required to be reported will be used by both District and ARB staff. Initially, owners or operators of stationary CI engines will be required to report information on their current inventory of engines. Those that are required to meet emission standards will be required to submit information to the district on how they plan on complying with the ATCMs requirements. Owners and operators of either engines that are less than or equal to 50 hp or agricultural engines will not be required to report any information, but those that sell these engines to end-users will be required to report to the ARB, the number of each make and model engine they sell for stationary applications. An "end-user" is defined as any person who purchases or leases a stationary diesel-fueled engine for operation in California. Persons purchasing engines for resale are not considered end-users. The following paragraphs discuss the reporting requirements in more detail.

Initial Reporting Requirements for Owners and Operators of Stationary CI Engines > 50 hp that are not used in Agricultural Operations

Table V-12 identifies the initial information that is required to be submitted to the District APCO by no later than January 1, 2005, by owners or operators of in-use stationary CI engines, and prior to the engine installation date by owners or operators of new stationary CI engines. The District APCO may exempt the owner or operator from providing all or part of the information identified in Table V-6 if the information is available in the owner or operators permit to operate. With the information provided, District staff will be able to develop a detailed inventory of engines subject to the requirements of the ATCM. The information will also be useful in updating the ARB's stationary engine inventory and emissions inventory, and for implementing the requirements AB 2588 (see Chapter X, Additional Considerations for a discussion of AB 2588 requirements). ARB staff will develop a standard spreadsheet format in Microsoft Word that will be made available to the public via our web site, http://www.arb.ca.gov. We request that submittals be made using the spreadsheet.

**Table V-12: Reporting Information – Stationary CI Engines Currently Operating in California**

| | |
|---|---|
| **Owner/Operator Contact Information** | (EXAMPLE RESPONSES) |
| Company Name | ABCD, Inc. |
| Contact Name, Phone number, address, and e-mail address | Joe Smith<br>999 High Desert Bluff Road,<br>Mojave, CA 90089<br>www.jsmith.com |
| Address of engine | Same as above |
| **Engine Information** | |
| Make | Acme |
| Model | 3006 D |
| Serial Number | Abcd1234567 |
| Year of manufacture (if unable to determine, approximate age) | Bought brand new in 1987 |
| Rated Brake Horsepower | 330 bhp @ 2200 rpm |
| Exhaust stack height from ground | 10 feet |
| *Engine Emission Factor and Supporting Data (if available)* | |
| PM | .25 g/bhp-hr (manuf. Test data) |
| NOx | 0.40 g/bhp-hr |
| HC | 0.25 g/bhp-hr |
| NMHC+NOx | N/A |
| CO | 0.25 g/bhp-hr |
| *Control Equipment* | |
| Turbo | X |
| Aftercooler | X |
| Injection Timing Retard | |
| Catalyst | |
| Diesel Particulate Filter | |
| Other | |
| *Fuel Used* | |
| CARB Diesel | |
| Jet Fuel | |
| Diesel | |
| Alternative Diesel Fuel | Biodiesel 50 |
| Alternative Fuel | |
| Combination (dual fuel) | |
| Other | |
| *Operation Information* | |
| Describe General Use of Engine | Stationary crane for loading trucks |
| Typical Load (% of bhp rating) | 80% load |
| Typical annual hours of operation | 200 |
| If seasonal, months of year operated and typical hours per month operated | N/A |
| Fuel Usage Rate (if available) | 7 gallons/hour |
| Distance to nearest offsite receptor | 14 miles (residence) |
| Is engine included in an existing AB 2588 emission inventory? | No |

Control Strategy Reporting Requirements for Owners or Operators of In-Use Stationary CI Engines > 50 hp that are not used in Agricultural Operations

No later than 180 days prior to the earliest applicable compliance date (see subchapter I for information on compliance dates), each owner or operator of an in-use stationary diesel-fueled CI engine shall provide the District with information identifying the control strategy for complying with the requirements of the ATCM. Examples of compliance strategies include 1) reducing hours used for maintenance and testing, 2) reducing diesel PM emissions by 85 percent through the implementation of a diesel particulate filter, and 3) removing an engine from service and replacing it with a new diesel-fueled CI engine that meets the ATCM requirements.

Sales Reporting Requirements for New Diesel-Fueled CI Engines > 50 hp Used in Agricultural Operations

Any person who sells a stationary diesel-fueled CI engine > 50 hp to another person who will operate it in California in an agricultural operation shall provide the information identified in Table V-13 to the Executive Officer of the Air Resources Board.

The sales reports will be due on the first of the year and will cover all sales during the previous calendar year. The first report is due January 1, 2006, and will cover all sales from January 1, 2005, to December 31, 2005.

**Table V-13: Reporting Information for Sellers of Stationary Agricultural Engines > 50 HP, and All Engines ≤ 50 HP**

| **Seller Contact Information** | | | | **(Example Responses)** | | | |
|---|---|---|---|---|---|---|---|
| Company Name | | | | ACME, Inc. | | | |
| Contact Name, Phone Number, Address, and E-Mail Address | | | | Joe Smith<br>999 Stony Road,<br>Truckee, CA 90089<br>www.jsmith.com | | | |
| **Engine Sales Information** | | | | | | | |
| **Make** | **Model** | **Model Year** | **Rated Brake Horsepower** | **Executive Order Number for Off-Road Certification** | **Engine Family Number** | **Emission Control Strategy** | **Number Sold** |
| CAT | 1234 | 2005 | 300 bhp @ 1800 rpm | 1232456 | 897654 | DPF | 14 |
| DDC | N/A | N/A (~1994) | N/A | N/A | N/A | DPF | 1 |

Sales Reporting Requirements for New Diesel-Fueled CI Engines < 50 hp

Any person who sells a stationary diesel-fueled CI engine ≤ 50 hp to another person who will operate it in California shall provide the information identified in Table V-12 to the Executive Officer of the Air Resources Board.

The sales reports will be due on the first of the year and will cover all sales during the previous calendar year. The first report is due January 1, 2006, and will cover all sales from January 1, 2005, to December 31, 2005.

### 2. Notification Requirements

Notification of Non-Compliance

Owners or operators that determine they are operating their stationary diesel-fueled CI engines in violation of the operating requirements or emission standards of the ATCM shall notify the district APCO upon detection and be subject to district enforcement action or variance provisions. Examples of non-compliance scenarios that should be detected by owners or operators include exceeding limits on annual hours for maintenance and testing operation, exceedance of emission limitation as determined through visual inspection (i.e., black smoke out of tail pipe.)

Notification of Loss of Exemption

Owners or operators of in-use stationary diesel-fueled CI engines that violate the conditions of their exemption (e.g., minimum distance to receptor requirements, annual hours of operation requirements) shall notify the district APCO of the exceedance upon detection. The engines shall then be brought into compliance with the appropriate emission standards and operating requirements of the ATCM by no later than 180 days after notification. The owners and operators of these engines shall provide the District APCO with emissions data showing compliance, as necessary. The types of emissions data that are acceptable for showing compliance are discussed in more detail in subchapter I.

Owners or operators of in-use stationary diesel-fueled CI engines exempt from the operating requirements or emission standards of the ATCM in accordance with Exemptions listed in subchapter D, shall be notified by the District APCO if the exemption no longer applies. No later than 180 days (may change to 18 months) after notification, the previously exempt engine must come into compliance with the appropriate emission standards and operating requirements and provide the District APCO with emissions data showing compliance, as necessary. The types of emissions data that are acceptable for showing compliance are discussed in more detail in subchapter I.

Monitoring Equipment and Recordkeeping Requirements

A non-resettable hour meter must be installed on all stationary diesel-fueled CI engines subject to operating requirements or emission limitations. For emergency standby engines, and those engines that have hours of operation limitations based on exemption criteria, the hour meters serve tool for District's to use when enforcing the requirements of the ATCM. However, because hour meters cannot determine between hours used for an emergency and hours used for maintenance and testing, the ATCM also requires records to be kept documenting the reason for operation of these engines. An owner or operator of an emergency standby engine or one subject to an exemption that limits hours of operation, must keep records of the number of hours the engines are operated on a monthly basis. Such records must be retained on-site for a minimum of 36 months from date of entry. Record entries must be retained on-site, either at a central location or at the engine location, and made immediately available to the District staff upon request. Record entries made 36 months from the most recent entry shall be made available to the District staff five working days from request. The monthly record log shall contain the following information:

- emergency use hours of operation
- maintenance and testing hours of operation, including ISC hours as appropriate
- hours of operation for emission testing to show compliance with the emission standards of the ATCM
- initial start-up hours
- other use hours.

A backpressure monitor must be installed on all engines that have a diesel particulate filter. The purpose of the backpressure monitor is to notify the owner or operator when the high backpressure limit of the engine is approached.

The district has the authority to require additional monitoring equipment dependant on the control strategy used to meet the emission standards of the ATCM.

## I. Emissions Data

This section identifies describes the types of information that can be submitted to the district APCO to show compliance with the emission standards of the ATCM. This information includes engine manufacturer's data, emission test data from similar engines, emission test data used in meeting the requirements of the Verification Procedure, certification data, and source test information from the engine subject to the requirements. ARB staff does not anticipate that a majority of the engines subject to the proposed ATCM will be required to be source tested. ARB staff believes that most owners of emergency standby diesel-fueled CI engines subject to the requirements of the proposed ATCM will reduce their hours of operation for maintenance and testing operations to below 20 hours per year. This is the most cost-effective method of compliance. For prime engines, and those emergency standby engines that are unable to reduce their hours of operation to below 20 hours per year, engine certification test data for post –1996 engines and manufacturers test data for post-1988 engines is available for many in-use engines.

<u>Engine Manufacturer's Data</u>

Many engine manufacturer's have historical emissions test data for 1988 model year engines and newer. For in-use stationary prime diesel-fueled CI engines, this data could be used to establish baseline emission levels. The owner or operator of the engine would submit the data to the District for review. The District would evaluate the engine manufacturer's data and determine how applicable it is to the baseline configuration of the engine. The type of information that should be submitted to the district when using engine manufacturer's emissions data to show compliance with the ATCM includes the following:

- Engine Make
- Engine Model Number
- Engine Serial Number
- Engine Family Number
- Year of Manufacture
- Engine Emission Rates
  - Test Method
  - Modal data
    a. PM
    b. NOx
    c. HC
    d. NMHC+NOx
    e. CO
- Weighted Average Value for Test for each pollutant

Verification Procedure

The Verification Procedure (Procedure) can be found on the ARB's web site at http://www.arb.ca.gov/regact/dieselrv/dieselrv.htm. The purpose of the procedure is to verify the emission reduction capability of technologies that can be used to reduce the emissions of diesel PM and NOx from diesel-fueled engines. The procedure requires the control technology manufacturers to identify the targeted emission control group. The term "Emission control group" means a set of diesel engines and applications determined by parameters that affect the performance of a particular control technology. Parameters can include engine cycle, engine size, operating load, fuel used, etc. The Procedure requires emission testing be performed in accordance with requirements defined in the Procedure. The emission testing results are from both baseline testing and post-control-technology-installation testing. To the extent that the emission control group includes an engine that is subject to the emission standards of this ATCM, the emissions test data that is used to support Verification can be used to support compliance with the ATCM.

Certification Data

Since 1996, diesel-fueled CI engines that are used in off road applications have been required to be certified in accordance with the ARB off-road regulations, California Code of Regulations, Title 13, section 2423. Similarly, U.S. EPA has required nonroad (which is equivalent to off-road) diesel-fueled CI engines to be certified in accordance with U.S. EPA nonroad regulations, Code of Federal Regulations, Title 40, Part 89. The goal of the California certification program was to harmonize with the federal certification program as much as possible. The test cycles identified in each of the programs are identified by different "names", but are otherwise identical. When certifying an off-road engine, the applicant identifies and tests an engine that is representative of a specific engine family. The certification results apply to all engines within that family. The emission tests are completed in accordance with the steady state cycles outlined in both certification programs. These test cycles are consistent with the test cycles that are identified in the ATCM as defined in ISO-8178 Part 4, and discussed in subchapter K, Test Methods. Upon District approval, and to the extent the certification test engine is similar in configuration to the engine seeking compliance with this ATCM, the certification test data can be used as baseline emission test data.

Source Test

To show compliance with the emission standards identified in the ATCM, the owner or operator always has the option of testing the engine. Subchapter J, Test Methods, provides information on the recommended test methods for showing compliance with the emission standards identified in the ATCM.

**J. Test Methods**

The proposed ATCM establishes emission standards for stationary diesel-fueled CI engines in the form of emission rate limits and percent reductions from baseline emission levels. In most cases, existing emission rate data from engine manufacturer testing, off-road engine certification, and control equipment verification can be used to show compliance with these emission standards. For those cases where no applicable emissions rate data exists, emission testing of the engine may be necessary. ARB staff has identified the following emission test methods as those that should be used to show compliance with the proposed ATCM. Alternatives to these test methods may be used upon approval of the District APCO.

Diesel PM

Diesel PM emission testing shall be done in accordance with one of the following three methods. See Appendix G, Test Method Workgroup, for a more detailed discussion of these methods:

- CARB Method 5 (front half, only, and in accordance with ISO 8178-4 cycles)
- International Standards Organization (ISO) 8178-1:1996(E); ISO 8178-2: 1996(E); and ISO 8178-4 1996(E).
- California Code of Regulations, Title 13, Section 2423, Exhaust Emission Standards and Test Procedures – Off-Road Compression Ignition Engines.

NOx, CO, and HC

Nitrogen Oxides, Carbon Monoxide, and Hydrocarbon emission testing shall be done in accordance with one of the following three methods:

- CARB Method 100 (in accordance with ISO 8178-4 cycles)
- International Standards Organization (ISO) 8178-1:1996(E); ISO 8178-2: 1996(E); and ISO 8178-4 1996(E).
- California Code of Regulations, Title 13, Section 2423, Exhaust Emission Standards and Test Procedures – Off-Road Compression Ignition Engines.

NMHC

Non-Methane Hydrocarbon emission testing shall be done in accordance with one of the following two methods:

- International Standards Organization (ISO) 8178-1:1996(E); ISO 8178-2: 1996(E); and ISO 8178-4 1996(E).
- California Code of Regulations, Title 13, Section 2423, Exhaust Emission Standards and Test Procedures – Off-Road Compression Ignition Engines

**REFERENCES:**

Fairbanks Morse. *Memo from Tony Biondi to Hans Huber: Exhaust emitted particulate matter measured from a 16-251F Alco engine*; February 16, 2000. (Fairbanks Morse, 2000)

Pacific Gas and Electric Company. *Letter responding to ARB's request for information on diesel-fueled engines at Diablo Canyon Power Plant*; August 6, 2002. (PG&E, 2002)

San Diego County Air Pollution Control Districts. *Facsimile from San Diego County APCD: Permit to Operate, Diesel-fueled Emergency Standby Engines operated by Southern California Edison at HY 101 Nuclear Gen Station, San Onofre, CA, Permit Number 960632*; June 18, 2003. (SDCAPCD, 2003)

California Air Resources Board. *Meeting with representatives from Diablo Canyon Nuclear Power Plant, San Onofre Nuclear Generating Station, San Diego County Air Pollution Control District, and San Luis Obispo County Air Pollution Control District*; September 11, 2002. (ARB, 2002)

California Air Resources Board. *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*; October 2000. (ARB, 2000)

# VI. TECHNOLOGICAL FEASIBILITY OF THE PROPOSED ATCM

There are a variety of technologies available to reduce diesel PM emissions from stationary diesel-fueled engines. Since the 1970's, much of the diesel emission control has been achieved through emission-conscious engine design. For example, emission improvements include modifications in combustion chamber geometry, increased fuel injection pressure, and design for better fuel atomization and mixing with the air. (DieselNet, 1998) In the past 15 years, more development effort has been put into catalytic exhaust emission control devices for diesel engines, particularly in the areas of particulate matter control. Those developments make the widespread commercial use of diesel exhaust emission controls feasible. (ARB, 2003a)

In this chapter of the staff report, we provide descriptions of PM reduction emission control strategies currently available and projected to be available in the near future. We focus on those we believe will be employed to comply with the proposed ATCM. Additional information on the wide variety of emission reduction options for diesel fueled engines is provided in the Diesel Risk Reduction Plan. (ARB, 2000) We also describe actual in-use experience with diesel PM emission control systems (DECS) or clean fuels that stationary engine operators are currently using and the results from a demonstration program undertaken by the ARB to further evaluate the applicability of various DECS to stationary diesel-fueled engines.

## A. New Engine Standards

Many advancements have been made in combustion technology and engine design that have significantly reduced the emissions from new diesel engines. Diesel engines today emit over 80 percent less PM and over 60 percent less NOx than they did in 1988. (Diesel, 2003) Beginning in 1996, manufacturers of diesel engines have been subject to U.S. EPA's nonroad diesel emission regulation (40 CFR Part 89). The nonroad diesel emission standards are tiered (i.e., Tier 1, 2, 3, 4), and the date upon which each tier takes effect depends on the engine size. As of January 1, 2000, all engine sizes were subject to Tier 1 standards. In 2006, all engines sizes will be subject to Tier 2, and in 2008, all engines sizes will be subject to Tier 3 standards. These standards, which become increasingly more stringent over time, will result in the development of new lower emitting diesel engines in the future years. More recently, in May 2003, U.S. EPA proposed new Tier 4 emission standards which will require most engines to meet a 0.01 g/bhp-hr emission rate in the 2011-2014 timeframe. The proposed Tier 4 standards, if adopted, will result in ultra-clean diesel engines that will be over 90 percent cleaner than 1988 vintage engines.

## B. Diesel PM Exhaust Aftertreatment Emission Controls

There are various advanced exhaust aftertreatment technologies commercially available that can provide significant reductions in diesel PM particularly when combined with low sulfur diesel fuel. The principal technologies that have been successfully used to reduce diesel PM from stationary diesel-fueled engines are diesel particulate filters

(DPFs) and diesel oxidation catalysts (DOCs). Flow through filters, sometimes referred to as enhanced DOCs, are relatively new to the market but also show promise in reducing diesel PM from diesel-fueled engines. These are each briefly described below.

Diesel Particulate Filters

DPFs have been successfully used in many applications, including prime stationary and emergency standby engines. In general, a DPF consists of a porous substrate that permits gases in the exhaust to pass through but traps the diesel PM. Diesel PM emission reductions in excess of 85 percent are possible, depending on the associated engine's baseline emissions, fuel sulfur content, and emission test method or duty cycle. In addition, up to a 90 percent reduction in CO and a 95 percent reduction in HC can also be realized with DPFs. (Allansson, 2000) Most DPFs employ some means to periodically regenerate the filter, i.e., burn off the accumulated PM. In California, diesel-fueled school buses, emergency backup generators, solid waste collection vehicles, urban transit buses, medium-duty delivery vehicles, people movers, and fuel tankers trucks have been retrofitted with DPFs through various voluntary and regulatory mandated programs as well as demonstrations programs. Particulate filters can be either active or passive systems.

Active DPFs use a source of energy beyond the heat in the exhaust stream itself to help regeneration. Active DPF systems can be regenerated electrically, with fuel burners, with microwaves, or with the aid of additional fuel injection to increase exhaust gas temperature. Some active DPFs induce regeneration automatically onboard the vehicle or equipment when a specified back pressure is reached. Others simply indicate when to start the regeneration process. Some active systems collect and store diesel PM over the coarse of a full day or shift and are regenerated at the end of the day of shift with the vehicle or equipment shut off. A number of the smaller filters are removed and regenerated externally at a "regeneration station." Because they have control over their regeneration and are not dependent on the heat carried in the exhaust, active DPFs have a much broader range of application and a much lower probability of getting plugged than passive DPFs.

A passive DPF is one in which a catalytic material, typically a platinum group metal, is applied to the substrate. The catalyst lowers the temperature at which trapped PM will oxidize to temperatures periodically reached in diesel exhaust. No additional source of energy is required for regeneration, hence the term "passive."

Field experience has indicated that the success or failure of a passive DPF is primarily determined by the average exhaust temperature at the filter's inlet and the rate of PM generated by the engine. These two quantities, however, are determined by a host of factors pertaining to both the details of the application and the state and type of engine being employed. As a result, the technical information that is readily accessible can sometimes serve as a guide, but it may be insufficient to determine whether a passive DPF will be successful in a given application. (ARB, 2002)

With regard to estimating average exhaust temperature in actual use, commonly documented engine characteristics such as the exhaust temperature at peak power and peak torque are insufficient. The exhaust temperature at the DPF's inlet is highly application dependent in that the particular duty cycle experienced plays a prominent role, as do heat losses in the exhaust system. Very application-specific characteristics enter the heat loss equation, such as the length of piping the exhaust must travel through before it reaches the DPF. Lower average exhaust temperatures can also be the result of operations of engines oversized for the application or engines run without a load applied. (ARB, 2002)

Diesel Oxidation Catalysts

Diesel oxidation catalysts (DOCs) are the most common currently used form of diesel aftertreatment technology and have been used for compliance with the PM standards for some on-highway engines since the early 1990s. DOCs are generally referred to as "catalytic converters." DOCs are devices attached to the engine exhaust system. They have chemicals lining them which catalyze the oxidation of carbonaceous pollutants – some of the soot emissions and a significant portion of the soluble organic fraction. These carbon-containing pollutants are oxidized to $CO_2$ and water. The catalysts that are used are known as the platinum group metals (PGMs). These consist of platinum, iridium, osmium, palladium, rhodium, and ruthenium. Platinum is best suited as the catalyst for diesel engine control devices; therefore, it appears that it will be the main catalyst used in diesel catalytic converters. (Kendall, 2002/2003)

DOC effectiveness in reducing PM emissions is normally limited to about 30 percent of diesel PM. This is because the soluble organic fraction portion of diesel PM for modern diesel engines is typically less than 30 percent. Additionally, DOCs increase sulfate PM emissions by oxidizing the sulfur in fuel and lubricating oil, reducing the overall effectiveness of the catalyst. Limiting fuel sulfur levels to 15 ppm allows DOCs to be designed for maximum effectiveness (nearly 100 percent control of soluble organic fraction emissions). DOCs also reduce emissions of HC and CO with reported efficiencies of 76 percent and 47 percent respectively. (Khair, 1999)

DOCs are also very effective at reducing the air toxic emissions from diesel engines. Test data shows that emissions of toxics such as polycyclic aromatic hydrocarbons (PAHs) can be reduced by more than 80 percent with a DOC. (DieselNet, 2002)

Flow Through Filters

Flow through filter (FTF) technology is a relatively new technology for reducing diesel PM emissions. Unlike a DPF, in which only gasses can pass through the substrate, the FTF does not physically "trap" and accumulate PM. Instead, exhaust flows through a medium (such as wire mesh) that has a high density of torturous flow channels, thus giving rise to turbulent flow conditions. The medium is typically treated with an oxidizing catalyst that is able to reduce emissions of PM, HC, and CO, or used in conjunction with a fuel-borne catalyst. Any particles that are not oxidized with the FTF flow out with the rest of the exhaust and do not accumulate.

The filtration efficiency of an FTF is lower than that of a DPF, but the FTF is much less likely to plug under unfavorable conditions, such as high PM emissions, low exhaust temperatures and emergency circumstances. The FTF, therefore, is a candidate for use in applications that are unsuitable for DPFs.

Combinations

Combinations of more than one technology are also being explored to maximize the amount of diesel PM reduction. For example, fuel-borne catalysts can be combined with any of the three main hardware technologies discussed above: DPF, FTF, or DOC.

## C. Cleaner Diesel Fuels, Alternative Diesel Fuels, and Alternative Fuels

Diesel PM emission reductions can also be realized through the use of cleaner diesel fuels, alternative diesel fuels, or alternative fuels (e.g., compressed natural gas). All stationary diesel-fueled engines would be required under the proposed ATCM to use low-sulfur diesel fuel, which will result in modest PM reductions by itself and will also enable the use of advanced exhaust aftertreatment systems for those engines that need DECS to meet the performance standards in the proposed ATCM. There are also some stationary engine operators that have explored the use of alternative diesel-fuels with some success and compressed natural gas fueled stationary engines are in use throughout California. While there are limitations to using alternative diesel-fuels and alternative fuels, particularly with emergency standby engines, we believe they may provide a satisfactory route to compliance for some engine operators. Below we describe some fuel options for stationary engines.

Low Sulfur Diesel Fuel (CARB Diesel)

Lowering the sulfur content of diesel fuel is important to the performance of aftertreatment technologies, particularly DPFs. Sulfur affects filter performance by inhibiting the performance of catalytic materials upstream of or on the filter (i.e., catalyst "poisoning"). This phenomenon not only adversely affects the ability to reduce emissions, but also adversely impacts the capability of these filters to regenerate - there is a direct trade-off between sulfur levels in the fuel and the ability to achieve regeneration. Sulfur also competes with the chemical reactions intended to reduce pollutant emissions and creates particulate matter through catalytic sulfate formation. The availability of low sulfur fuel (i.e., less than 15 ppm) will enable these filters to be designed for improved PM filter regeneration and emission control performance, as well as to reduce sulfate emissions. Indeed, diesel fuel containing less than15 ppm sulfur is required to ensure maximum emission control performance on the broadest range of diesel non-road engines possible. (MECA, 2003)

Recently, the ARB approved amendments to the California diesel fuel regulations. One of the proposed amendments reduces the sulfur content limit from 500 parts per million by volume (ppmv) to 15 ppmv for diesel fuel sold for use in California in stationary source engines, on-road and off-road motor vehicles starting in mid-2006. This reduced sulfur content will provide a small emission benefit because a portion of PM emissions is comprised of sulfates, the formation of which is a direct function of the level of sulfur in the fuel. (Diesel, 2003) The availability of 15 ppm sulfur fuel will also allow after-treatment manufacturers to use more highly active catalysts, which operate effectively at lower temperatures and have a broader range of vehicle applications. Low sulfur diesel is available today for use by centrally fueled fleets in voluntary emission reduction programs, and we believe it will be widely available by 2005 when the ATCM would become enforceable. (Diesel, 2003)

Alternative Diesel Fuels

Alternative diesel fuel is a fuel that can be used in a diesel engine without requiring engine or fuel system modifications for the engine to operate, although minor modifications (e.g., recalibration of the engine fuel control) may enhance performance. Examples of alternative diesel fuels include biodiesel, emulsified fuels, Fischer-Tropsch fuels, or a combination of these fuels with CARB Diesel fuel. A detailed discussion of these fuels is provided in the Diesel Risk Reduction Plan. (ARB, 2000) These alternatives may result in significant benefits for higher-emitting categories, such as off-road engines. Synthetic or alternative diesel fuels may also prove to be part of the preferred control strategy for diesel-fueled engines that would otherwise result in relatively high risk, or where control retrofit options are very expensive or difficult to implement. The emissions effects of these fuels can vary widely. There has not been significant penetration of these fuels into stationary engine applications. However, biodiesel is being used with some success in both prime and emergency standby engines.

Alternative Fuels

Alternative fuels, such as natural gas, propane, ethanol or methanol, are options available to reduce emission from diesel engines. There are several prime stationary engine applications that are successfully using compressed natural gas (CNG) as an alternative to diesel-fuel. These engines have significantly lower emission levels than a comparable engine operating on diesel fuel. An operating cycle for compression ignition engines involves injecting a small amount of diesel along with natural gas into the combustion chamber. The heat generated by compressing this mixture ignites the diesel fuel that in turn ignites the natural gas mixture, operating much like a conventional diesel engine. CNG is available at over 100 retail outlets in California. (CEC, 1999)

For many years, natural gas has been an efficient, clean burning power application for prime engines. Natural gas produces prime power in a wide variety of industries from heat treating to printing. Storage problems (i.e., space and leak containment) and higher operating costs associated with other fuels are eliminated using natural gas. (Peoples, 2003) Other advantages of using natural gas are the extended time between oil changes and cleaner, cooler combustion compared to diesel or propane fuel.

Natural gas can also be used in some emergency stand by applications. Natural gas is an energy source permitted by National Fire Protection Association (NFPA) Standard for Emergency and Standby Power Systems (NFPA 110). Natural gas would be an appropriate power supply where failure of an emergency power supply source is less critical to human life and safety, for example, heating and air conditioning systems, communication systems, ventilation and smoke removal systems, sewerage disposal, lighting, industrial processes. Natural gas would be inappropriate in safety situations to human life, where an on-site storage tank would be required. (NFPA, 2002)

**D. Engine Design Modification or Repower**

There are engine modifications that can be employed, generally at the time of an engine rebuild to reduce emissions. Two examples of engine design modifications, that reduce PM emissions are a diesel engine reengineering kit produced by Clean Cam Technology (Clean Cam) and the ECOTIP Superstack Fuel Injectors (ECOTIP) distributed by Interstate Diesel.

Clean Cam consists of specific engine retrofit components, including a proprietary camshaft. The product reduces NOx emissions by increasing the volume of exhaust gas that remains in the combustion chamber after the power stroke. Within the combustion chamber, the residual exhaust gas absorbs heat and reduces the peak combustion temperature, which results in lower NOx emissions. The injection timing can then be adjusted (i.e., advanced) to maximize the diesel PM emission reductions or it can be varied to achieve the desired balance of NOx vs. PM. The product reduced diesel PM and NOx emissions from eleven pre-1993 and four pre-2000 models of two-stroke diesel-fueled engines manufactured by Detroit Diesel Corporation (DDC).

Interstate Diesel takes a different approach with the ECOTIP Superstack Fuel Injectors to reduce emissions from existing engines. This product has been shown to reduce diesel PM emissions from engines manufactured by General Motors Electro-Motive Division (EMD) and DDC. The product consists of a fuel injector with a reduced sac volume and a more consistent fuel injection pressure, and it can be incorporated into either mechanical or electronic fuel injection systems. The product improves combustion and reduces diesel PM emissions by minimizing the amount of fuel that drips into the combustion chamber at the end of the chamber's fuel injection cycle. The manufacturer states that the overall diesel PM removal efficiency can be as high as 44 percent for EMD engines and as high as seven percent for DDC engines. The product is commercially available and has been installed on approximately 2,000 diesel-fueled engines.

Repowering (i.e., replacing the engine) can be a viable and cost-effective way to reduce emissions from older uncontrolled diesel engines. (Diesel, 2003) Heavy-duty diesel engines manufactured today are significantly cleaner than those built just a short time ago and can provide significant NOx and PM benefits when compared to an older engine. Repowering can be particularly cost-effective in situations where the engine would have been removed anyway for a rebuild. (Diesel, 2003)

Another alternative is to replace a diesel-fueled engine with a fuel cell. Fuel cells have captured worldwide attention as a clean power source and have generated interest and enthusiasm among industry, environmentalists, and consumers. In principal, a fuel cell operates like a battery. A fuel cell converts chemical energy directly into electricity by combining oxygen from the air with hydrogen gas. However, unlike a battery, a fuel cell does not run down or require recharging. It will produce electricity as long as fuel, in the form of hydrogen, is supplied. Fuel cells have been a reliable power source for many years. Installations have occurred at Kaiser Hospitals in Anaheim and Riverside, the University of California at Irvine, Las Virgenes Municipal Water District in Calabasas, the Chevron Texaco Headquarters building in San Ramon, and several military installations, to name a few. Applications include electrical power supply for space flights, as well as conventional electric power generation in buildings and power plants. Fuel cell manufacturers are looking at all markets; one specific market is for smaller applications, including premium power applications, rural and remote applications, residential power applications, backup power for telecommunications systems and cell towers, and other premium power applications. At current prices, fuel cells are most suitable for power applications where the cost of the fuel cell is not a primary issue when compared, for example, to the loss of critical equipment and data.
(CSFCC, 2002)

## E. Reducing Hours of Operation

Reducing the number of hours an engine is operated may be an available option to reduce diesel PM emissions for some diesel power sources, particularly for emergency standby engines. In cases where an alternative fuel, emission control device, or repowering are not practical or economically feasible, owners of emergency standby engines may consider reducing the hours of operation for maintenance and testing to reduce emissions. Non-life-critical emergency back up generators could reduce hours of operation for maintenance and testing. NFPA 110 offers suggested standards for generator maintenance and testing of 30 minutes per month. (NFPA, 2002) Depending on individual power needs, the NFPA 110 maintenance and testing standards could be followed in cases where operators are unnecessarily operating more than the recommended six hours annually for maintenance and testing, thereby reducing the diesel PM emissions.

## F. Verification of Diesel Emission Control Devices

In support of the ARB's regulatory efforts to reduce diesel PM, the *Verification Procedure, Warranty and In-Use Compliance Requirements of In-Use Strategies to Control Emissions from Diesel Engines* (Verification Procedure) was adopted by the Board in March 2002. The Verification Procedure establishes a process through which manufacturers of emission control equipment can demonstrate and verify the emission reduction capabilities of control technologies. Examples of emission control technologies that can be considered for verification include diesel particulate filters, diesel oxidation catalysts, exhaust gas re-circulation, selective catalytic reduction systems, fuel additives and alternative diesel fuel systems. The Verification Procedure is voluntary and applies to emission control technologies for on-road, off-road and stationary applications. While the proposed ATCM does not require the use of verified systems to demonstrate compliance, some operators may choose to purchase a verified system. A brief discussion on the Verification Procedure is provided in this section.

The Verification Procedure requires emission control strategy applicants to establish the emissions reduction capabilities for a emission control device, conduct a durability demonstration, conduct a field demonstration and submit results along with other information in an application to the ARB following a prescribed format. The applicant verifies the product for a specific engine manufacturer, years produced, engine family and series. If the ARB approves the application, it will issue an Executive Order to the applicant stating the verified emission reduction and any conditions that must be met for the diesel emission control strategy to function properly. The Verification Procedure also requires that the applicants provide a warranty to the end-user and conduct in-use compliance testing.

The results of the Verification Procedure testing determine the control technology classification. The multi-level verification system consists of three PM reduction levels. The Verification Procedure also has provisions for verifying strategies that reduce NOx emissions. Control device verifications for both PM and NOx are classified by level as listed in Table VI-1.

**Table VI-1: Verification Classifications for Diesel Emission Control Strategies**

| Pollutant | Reduction | Classification |
|---|---|---|
| PM | <25% | Not Verified |
| | ≥ 25% | Level 1 |
| | ≥ 50 % | Level 2 |
| | ≥ 85% or ≤0.01 g/bhp-hr | Level 3 |
| NOx | <15% | Not Verified |
| | ≥15% | Verified in 5% increments |

Once a device has been verified, the executive order and accompanying information is posted on the ARB's web site at http://www.arb.ca.gov/diesel/verifieddevices/verdev.htm.

With respect to verification for stationary applications, CleanAIR Air Systems received verification on June 6, 2003, for its PERMIT™ filter for 85 percent particulate reduction. The Table VI-2 below outlines specific operating criteria for the verified CleanAIR Systems diesel particulate filter. (ARB, 2003b)

**Table VI-2: CleanAIR Systems PERMIT™**

| | |
|---|---|
| Maximum consecutive minutes at idle | 240 minutes |
| Number of 10 minute idle sessions before regeneration is required | Regeneration recommended after 12 consecutive sessions; required after 24 |
| Minimum temperature/load/time requirements for regeneration in 4-stroke engine | 300° Celsius for 30% of operating time or 2 hours, whichever is longer. For most engines, 40% load results in temperature of at least 300°Celsius |
| Number of hours of operation before cleaning/disposal of filter | 5000 hours under normal operating conditions |
| Fuel | Diesel sulfur content must not exceed 15 parts per million by weight |
| PM emission/certification level | Equal or less than 0.1 g/bhp-hr (as tested on an appropriate steady-state certification cycle outlined in the ARB off-road regulations - similar to ISO 8178 D2) |
| Cycle | Four-stroke |

There are also three additional emission control technologies, one fuel additive one DPF and one DOC, currently going through the verification process that are applicable to stationary engines.

## G. In-Use Experience with Diesel PM Emission Control Strategies

To verify that control technologies are commercially available and have been demonstrated, ARB staff interviewed operators of stationary engines that have actual experience with a variety of DECS, alternative diesel-fuels or alternative fuels. Questions on operating performance, reliability, and effectiveness were asked to provide a better understanding of the actual in-use performance of available DECS or alternative fuels and the technological feasibility of the proposed performance standards in the ATCM. Operators of both emergency standby and prime engines were interviewed.

Emergency Standby Engines: In-Use Experience

There are numerous emergency standby engines in California that have DPFs or DOCs installed. As shown in Table VI-3, installed DECS are reducing diesel PM emissions on engines providing emergency back-up power to a variety of industries. ARB staff interviewed representatives from eight of the facilities to determine actual in-use experience. Summaries of the interviews are provided below. The DECS were installed on model year engines ranging from 1993-2002. The most common technologies are DPFs. Of those interviewed, most stated that the DECS required little or no extra maintenance. Most companies installed the DECS to meet the local air pollution control permit requirements and others to reduce odor complaints from neighbors. Many of the engines had source test data to support the emission reductions. All of the engines were on a regular maintenance and testing schedule.

There are also emergency standby engines that are currently using alternative fuels. ARB staff interviewed engine owners currently using biodiesel or compressed natural gas. Biodiesel offered a large reduction in diesel PM emissions. There was minor extra maintenance required to prevent biodiesel (B50) from clogging fuel filters. A drawback to biodiesel is the increase in NOx emissions that occur particularly with the blends having a larger portion of biodiesel. Natural gas powered engines offer a non-diesel power source. For example, the Advanced Micro Devices (AMD) engine is used for emergency backup and participating in a peak shaving program. Feedback from owners is that natural gas engines do not require extra maintenance. A paragraph about AMD natural gas engines and Mt. Rainer National Park using biodiesel provides more details on in-use experience with alternative fuels.

**Table VI-3: In-Use Emergency Standby Stationary Engines with DECS**

| Location | Facility Type | Engine Make and Horsepower | Emission Control System |
|---|---|---|---|
| San Joaquin Valley APCD, CA | Public Works | Caterpillar 3516B 2848 hp | CleanAIR Systems DPF |
| Bay Area AQMD, CA | County Service Center | Cummins KTTA 50-G2 2220 hp | CleanAIR Systems DPF |
| Butte County AQMD, CA | Brewery | (2) Caterpillar 3412 1100 hp each | Engelhard DPF |
| Bay Area AQMD, CA | Communications | (3) Caterpillar 3516 2479 hp each | Engelhard DPX |
| Bay Area AQMD, CA | Communications | Caterpillar 512 1005 hp | Engelhard DPX |
| Bay Area AQMD, CA | Communications | Caterpillar 3516B 2479 hp | Engelhard DOC |
| San Joaquin Valley APCD, CA | Medical Center | Caterpillar 3406 519 hp | Engelhard DPX |
| San Joaquin Valley APCD, CA | Hospital | Caterpillar 3516B 2680 hp | CleanAIR Systems DPX |
| Bay Area AQMD, CA | Communications | Caterpillar 3412C 896 hp | CleanAIR Systems |
| Tehama APCD, CA | Communications | Caterpillar 3406 449 hp | DCL MINE-X SOOTFILTERS® |
| Colusa County APCD, CA | Communications | Caterpillar 3406 449 hp | DCL MINE-X SOOTFILTERS® |
| Bay Area AQMD, CA | Communications | Caterpillar 1800 hp | Ceryx Quad Cat |
| Butte County AQMD, CA | Communications | Detroit Diesel 7243 1550 hp | CleanAIR Systems |
| Bay Area AQMD, CA | Communications | (6) Caterpillar 3516 2000 hp | Unknown |

**Table VI-3 (continued)**

| Location | Facility Type | Engine Make and Horsepower | Emission Control System |
|---|---|---|---|
| Bay Area AQMD, CA | Candy Company | Caterpillar 3516B 2680 hp | CleanAIR Systems |
| San Diego County AQMD, CA | Data | (2) Caterpillar 1072 and 536 hp | Caterpillar DPF |
| San Diego County AQMD, CA | Hotel | (2) Caterpillar 175 hp | Caterpillar DPF |
| Butte County AQMD, CA | Communications | Cummins KTA50-G9 2200 hp | Nett Technologies |
| San Joaquin Valley APCD, CA | Communications | Caterpillar 3406 587 hp | Englehard DPX, DPF |
| San Joaquin Valley APCD, CA | Unknown | John Deere 6076 300 hp | Unknown |
| Bay Area AQMD. CA | Communications | Caterpillar 3412C 804 hp | CleanAIR Systems |
| South Coast APCD, CA | Construction | Caterpillar 3512B 1876 hp | CleanAIR Systems |
| Bay Area AQMD, CA | Communications | Caterpillar 3516B 2680 hp | CleanAIR Systems |
| Bay Area AQMD, CA | Data | Caterpillar 3406C 536 hp | CleanAIR Systems |
| Bay Area AQMD, CA | Data | Perkins 3.8L, 80.4 hp | CleanAIR Systems |
| San Luis Obispo County APCD, CA | Energy | Cummins KTTA50 2142 hp | CleanAIR Systems |
| San Joaquin Valley APCD, CA | Hospital | Caterpillar 3516B 2680 hp | CleanAIR Systems |
| Bay Area AQMD, CA | Equipment Sales | Caterpillar 3508 1340 hp (2) Caterpillar 3512C 804 hp (2) Caterpillar 3506C 536 hp | CleanAIR Systems |
| San Joaquin Valley APCD, CA | Equipment Sales | Detroit Diesel Series 60 335 hp | CleanAIR Systems |
| San Diego County AQMD, CA | Municipality | Caterpillar 3512 1608 hp | CleanAIR Systems |
| South Coast APCD, CA | Manufacturer | Isuzu 4GB1 67 hp | CleanAIR Systems |
| Unknown | Power Generation | (10) Various | CleanAIR Systems |
| Various | Various | (7) Various | Various Systems |

<u>Emergency Standby Engines: Summaries of Interviews Regarding In-Use Experience</u>

*Kings County Department of Public Works*: Kings County Department of Public Works, located in Hanford, California, installed a CleanAIR Systems Inc. Permit™ catalyzed diesel particulate filter on a diesel-fueled Caterpillar 3516B 2000 kilowatt (kW) generator set operating on CARB low sulfur diesel fuel (<15 ppm sulfur). The engine is model year 2000 and is used for emergency power and complies with an interruptible load contract with Southern California Edison. An interruptible contract allows Kings County to receive electricity at a reduced cost but must disconnect from the local utility when notified. According to the Kings County Public Works Director, the engine has run over 800 hours since installation in 2001 and they have not experienced any problems with the DPF. CleanAIR Systems removed the filter after 556 hours to inspect soot build up which would indicate if the DPF was regenerating properly. The inspection results revealed very clean filters, which indicate the engine was reaching and sustaining adequate temperatures to ensure regeneration. Emission testing of the engine, with and without the DPF installed, was also conducted and demonstrated that the DPF was reducing emissions by 85 percent. The emissions test also provided information to verify the PERMIT™ system with the ARB. (ARB, 2003b) (NESCAUM, 2003) (Kings, 2003)

*Santa Clara County:* Santa Clara County operates a standby emergency generator set, located at the Santa Clara County Government Facility located in San Jose, California. In 1997, Santa Clara County installed a CleanAIR Systems, Inc. CleanDIESEL™ soot filter DPF on a diesel-fueled Cummins Model KTTA 50-G2 operating on CARB Diesel fuel. The engine is a V-16, 2220 horsepower at 1,800 rpm, 3067 cubic inch turbo charged engine. The exhaust is configured with twin exhaust outlets, each of which is equipped with CleanDIESEL™ soot filters. The engine operates an Onan Model 1500 DFMP generator with a rated output of 1500 kW. A representative with Santa Clara County stated the DPF was installed to eliminate odor and employee complaints. The ARB completed source tests on this engine exhaust with and without the DPF in place. The engine was running at 100 percent load, and a CARB Method 5 (Determination of Particulate Matter emissions from Stationary Sources) was used to determine emission levels. Based on the results, when considering the front half as recommended in the proposed ATCM, the DPF had an efficiency of approximately 75 percent. Using the total PM (front half and back half), the efficiency was much lower due to an unusually high contribution from the back half. (NESCAUM, 2003) (Santa Clara, 2002) (Santa Clara, 2003)

*Sierra Nevada Brewery:* Sierra Nevada Brewery Company (SNBC) located in Chico, California installed Engelhard DPX DPFs on a pair of CARB diesel fueled Caterpillar 3412 engines each driving 750 kW generators. The engine exhaust is configured with twin exhaust outlets, each of which is equipped with DPFs. In 1997 and 1999, the engines were purchased to produce emergency electrical power. To meet air quality requirements, SNBC installed the DPFs in 1999 and 2000. The ARB has completed emissions tests on the engines. The emission controls system reduces diesel PM emissions by 85 percent from 0.164 g/bhp-hr to 0.025 g/bhp-hr. The Sierra Nevada Brewery has not had any problems with the DPFs. According to a Sierra Nevada Brewery representative, they identifed two disadvantages with the DPFs. First, the engine must run a little longer to reach temperature high enough to burn off soot buildup, and second, there was higher initial cost for the dual exhaust added to eliminate potential back-pressure problems and filter assemblies. (SNB, 2003) (NESCAUM, 2003) (Sierra, 2000)

*SBC Telecommunications:* SBC Telecommunications (SBC), has five emergency backup generators located in San Francisco and one engine in San Jose that have been retrofitted with diesel emission control strategies. SBC had ECS's installed on each of the emergency backup generator engines to respond to smoke and odor complaints.

SBC in San Francisco has five Caterpillar emergency backup engines powering generators with ECS's installed on the engines. In 1993 four Englehard DPFs were installed on three Caterpillar 3516 and one Caterpillar 3516B, 2479 horsepower engines. In 1999, an Englehard DPF was installed on a Caterpillar 3512, 1005 horsepower engine. All of the engines burn CARB diesel fuel. A representative of SBC stated that the emission control strategies were installed to reduce both particulate emissions and odor complaints. The engines are exercised for about an hour per month for maintenance and testing. To reduce public's exposure to exhaust emissions the engines are run early in the morning but the odor complaints continued. Subsequent inspections revealed that the encased Engelhard DPX filters cracked and repairing the cracked unit was difficult. The Englehard DPX filters remove CO, HC and PM. (SBC, 2003) (NESCAUM, 2003)

Emissions tests were completed on the Caterpillar 3516 engines. The results revealed the engines were emitting 0.239 g/bhp-hr prior to emission controls, with an ECS installed the PM emissions were reduced to 0.036 g/bhp-hr (85 percent reduction). (NESCAUM, 2003) (SBC, 2003)

In San Jose SBC installed a Englehard DOC on a Cummins KTA50-G9, turbocharged and aftercooled, 2,220 horsepower engine burning #1 or #2 diesel fuel powering an emergency generator. The engine is exercised for an hour per month for maintenance and testing. An emission test showed a 25 percent reduction of diesel PM emissions with the DOC installed. When the engine was installed in 2000, a DOC was mounted on the exhaust to control odors. Since installation odor complaints have been eliminated. (SBC, 2003) (NESCAUM, 2003)

*Memorial Hospital of Los Banos*: Memorial Hospital of Los Banos in Los Banos California installed an Engelhard DPX diesel particulate filter on a 1994 Caterpillar 3406, 519 horsepower engine operating an emergency backup generator. The particulate filter was installed in 2002 to satisfy San Joaquin Valley Air Pollution Control District emission permit requirements. The hospital runs the engine about 30 minutes per week for maintenance and testing. The exhaust temperature is monitored during the weekly engine test. According to an engineer with Memorial Hospital of Los Banos, the exhaust gas temperature reaches 1000 degrees F, for 30 percent of the run time, which is sufficient to regenerate trapped diesel PM and keep the filter clean. Annual turning over of the DPF units is the only maintenance the unit would need. The filter has not been turned over because the engine produces high exhaust temperatures. (Los Banos, 2003)

*Fresno Regional Medical Center:* Fresno Regional Medical Center in Fresno, California installed a PERMIT™ CleanAIR catalyzed diesel particulate filters on five 2002 Caterpillar 3516TA, 2680 horsepower engines that power Caterpillar SR4 B emergency backup generators. As part of the SJVAPCD permit, the medical center was required to reduce PM emissions. Emission information was provided to the project manager at the Medical Center. The data stated a Caterpillar generator will produce 0.10 g/bhp-hr PM emissions without an emission control device. The Caterpillar generator running on CARB diesel and a particulate filter has PM emissions reported at 0.01 g/bhp-hr. The PERMIT™ System being used by the Fresno Regional Medical Center has been verified by the ARB. The generator units are new and scheduled maintenance has not needed to be performed. (Fresno, 2003a) (Fresno, 2003b)

*Intel Corporation*: Intel Corporation located San Jose California, installed two CleanAIR Systems diesel particulate filters a Caterpillar 3412C, 896 horsepower engine which powers an emergency backup generator. The facilities manager stated that they have not had any problems with the emission control device and there is no extra maintenance. Intel has not had an emergency to use the engine for an extended period of time, the engine runs 30 minutes per month for maintenance and testing purposes. (Intel, 2003)

*Sierra Pacific Power Company:* Sierra Pacific Power Company (SPPC) owns and operates two diesel powered electric generators at a substation located at Kings Beach in Northern California. The two diesel engines at the substation are General Electric Model 20-645-E4, 20 cylinder, turbo-charged engines. B100 (100 percent biodiesel) was used to minimize emissions. Testing was completed on one of the engines under 90 to 100 percent load. The first test was completed on December 1990 using off-road diesel fuel a second test was completed September 2002 using B100 fuel. Table VI-4 summarizes test results performed comparing off-road diesel and biodiesel. The emission testing demonstrated over 40 percent reduction in total PM. There was also about a 30 percent increase in NOx emissions. At this time the decision as to whether or not to use biodiesel has not been made. (Tetra Tech, 2002)

**Table VI-4: Biodiesel (B100) Emission Reductions vs. Off-Road Diesel**

| Emissions | Reductions |
|---|---|
| Filterable PM | 63.5% |
| Total PM | 42% |
| CO | 28% |
| SO2 | 92% |
| NOx | +32% |

*Pacific Gas and Electric:* Pacific Gas and Electric, Kettleman Station (PG&E) is located in Avenal, California installed a natural gas fired emergency generator in 2000. Because PG&E is a company that supplies natural gas, the decision to run the emergency engine on natural gas was straightforward. The engine is a 2000 Caterpillar 63512 EPG, 414 horsepower engine. The engine runs about four hours per week at 25 to 30 percent load. According to the engine operator, the natural gas engine requires no special maintenance. The local air quality district has not required emission tests on this engine. (PG&E, 2003)

*Advanced Micro Devices:* Advanced Micro Devices (AMD) located in Sunnyvale, California purchased a natural gas powered emergency backup engine in late 2001. The engine is a 16V-AT27EL Waukesha engine producing 4073 horsepower. The Waukesha engine is turbo-charged, after-cooled, and lean burning. The engine was installed to prevent rolling blackouts. When notified of a rolling blackout, AMD must reduce the load from the power grid by 15 percent in 15 minutes. This engine will remove 15 percent of the load keeping the Sunnyvale facility powered. Currently the engine is participating in a peak shaving program and has been running since May 2003, five days a week for seven hours a day. The AMD Environmental Health and Safety Department stated that natural gas combustion has not caused engine problems. (AMD, 2003)

<u>Prime Engines: Summaries of Interviews Regarding In-Use Experience</u>

Prime engines also utilize different strategies to reduce diesel PM emissions. Most of the prime engine owners interviewed by the ARB staff installed DECS to meet local air district permit requirements. Source tests have been completed on the engines, some comparing the before and after effects of the control device. Natural gas is a common alternate fuel. The South Coast Air Quality Management District requires new prime engines to run on an alternative fuel. An extensive database listing prime engines has not been compiled. Table VI-5 below provides examples of prime engines with emission control devices installed, followed by interviews with some of those engine owners.

## Table VI-5: In-Use Prime Stationary Engines with DECS

| Location | Facility Type | Application | Engine Make and Horsepower | Emission Control System |
|---|---|---|---|---|
| San Joaquin Valley Unified APCD, CA | Parks and Recreation Department | Water Pump | John Deere 6068TF150 155 hp | Cleaire DPF |
| Northern Sierra APCD, CA | Rock Crushing Facility | Rock Crusher | Caterpillar 3406 587 hp | DOC |
| Bay Area AQMD, CA | Port Terminal | TRU Generator | Cummins KTA19G3 685 hp | DPF |
| Bay Area AQMD, CA | Recycling | Wood Chipper | Caterpillar 3412 750 hp | DOC |
| Bay Area AQMD, CA | Recycling | Wood Chipper | Caterpillar 3412 DITTA 800 hp | DPF, DOC |
| San Diego County APCD, CA | Waste Water | Electric Power Generation | Caterpillar 3512B 1718 hp | Clean Diesel Technology Platinum Plus DFX |
| San Joaquin Valley Unified APCD, CA | Public Works | Electric Power Generation | Caterpillar 3516B 2848 hp | DPF |
| San Diego County APCD, CA | Ship Construction | Gantry Crane | Cummins (2) QST30-G1-NR1 (2) QSX-15-G9 QST30-G1-NR2 QST30-G1-NR3 | Engelhard DPX SCR |
| San Diego County APCD, CA | Dam Project | Power Supply | Caterpillar (6) 3516B | Engelhard DPX SCR |

*Kern County Parks and Recreation*: Kern County Parks and Recreation Department in Kern County California, placed a Cleaire C-DPF on 1978 John Deere 6068TF150, 155 horsepower engine in 2002, burning off-road diesel fuel. The engine is used to pump water to a local campground at Lake Ming. The catalyzed diesel particulate filter was installed to satisfy San Joaquin Valley Air Pollution Control District permit requirements. The engine runs about 4 hours per day, approximately 784 hours per year. According to representatives of the Kern County Parks and Recreation Department there have been no problems or additional maintenance with the engine associated with the diesel particulate filter. (Kern, 2003)

*TransBay Container Terminal Incorporated*: TransBay Container Terminal, Inc. (TransBay) is located at the Port of Oakland in Oakland California. A diesel particulate filter was installed in March 2001 on a 1995 Cummins DTA19G3, 685 horsepower engine. The engine runs a generator and burns off-road diesel fuel. The diesel particulate filter was installed to reduce emissions of diesel PM meeting requirements of the Port of Oakland and the Bay Area Air Pollution Control District. The engine is used daily and runs about 1450 hours per year at about 50 percent load. A TransBay representative stated that they have not had any problems with the diesel particulate filter. (TransBay, 2003)

*City of San Diego Metropolitan Waste Water Department*: The City of San Diego MWWD, in San Diego California have installed a Clean Diesel Technology Platinum Plus DFX diesel particulate filter on a 1997 Caterpillar 3512B, 1718 horsepower engine. The engine powers a generator to produce electrical power by burning diesel fuel and digester gas. The generator produces 1200 kW of power and uses 22.2 gph diesel and 15,941 scf of digester gas. Burning 100 percent diesel at 1200 kW the engine consumes 100 gpm. The lead operator of the engine stated that the filters have been clogging. They sent soot samples to a laboratory for analysis. The analysis revealed the soot is comprised primarily of inorganic silicates from the digester gas. The clogging will be resolved by cleaned the filter every 3 weeks. San Diego County Air Pollution Control District (SDCAPCD) required the engine to install a diesel particulate filter and limited the hours of use to 730 per year. (San Diego, 2003a) (San Diego, 2003b) (San Diego, 2003c) (San Diego, 2003d)

*Zanker Road Resource Management, Ltd:* Zanker Road Resource Management, Ltd. (Zanker Road) is recycling plant and small landfill located in Milpitas, California. They have installed a DOC unit on a 1996 Caterpillar 3412 750 horsepower engine. Zanker Road has also installed a DOC/DPF unit on a 1999 Caterpillar 3412DITTA, 800 horsepower engine. Both engines burn off-road diesel fuel and are used to power wood chippers. The engine operator with Zanker Road did not know the manufacturer of the emission control units but did know they are very large, almost as large as the engine itself. A framework has been built to hold the emission control device. The wood chipper unit vibrates during operation originally causing cracks in the framework bracing. The crack has been fixed and more bracing was added to reduce vibration effects. (Zanker, 2003)

*National Steel and Shipbuilding Company (NASSCO):* NASSCO is located in San Diego California has six gentry cranes with emission control devices installed. The Cummins engines are four QST-30-G1 and two QSX-15-G9, produce 1030 and 680 horsepower respectively. The engines run between 1075-3761 hours per year. The engines have Engelhard DPX catalyzed diesel particulate filters to remove particulate matter. Additionally, the engines have selective catalytic reduction system with urea injection, controlling NOx emissions. A 40 percent aqueous solution of urea is used as a reagent. Urea is injected into the exhaust at 0.34 gallons per hour with less than 10 ppm ammonia slip. Exhaust gas temperatures are maintained above 715° F with an exhaust heater to properly regenerate the DPF. The SCR requires temperatures above 570° F to remove NOx efficiently. Air pollution control equipment was installed to meet San Diego County Air Quality District requirements. (NESCAUM, 2003)

*Mt. Rainer National Park*: Mt. Rainer National Park is currently converting all diesel applications to biodiesel fueled engines (prime and emergency standby). A B50 biodiesel blend was selected to run the engines at the park. B50 is a blend of 50 percent diesel fuel and 50 percent biodiesel fuel. According to the maintenance manger at Rainer National Park, a 90 kW generator located in a remote area has been using B50 for fuel. This engine runs 24 hours a day 3 months of the year. When they began using B50 fuel the engine was having problems with a fuel filter clogging. The problem was resolved by changing the fuel filter during regular scheduled maintenance. The fuel filters are changed monthly on the snow removal equipment to avoid filter clogging. They are currently replacing the diesel fuel blend to an ultra low sulfur diesel fuel. (Mt. Rainer, 2003)

*Fetzer Five River Ranch Winery:* Fetzer Five River Ranch Winery (Fetzer) located in Paso Robles, California installed two used 1963 Waukesha F-817 engines that have been configured burn natural gas. The engines are used to power refrigeration units controlling fermentation at the winery. Combined the engines run a total of 600 hours per year mainly from August to October. The decision to run on natural gas was by the winery to do an environmentally friendly alternative to diesel. The operations manager stated the engines have not required extra maintenance because they burn natural gas. (Fetzer, 2003)

## H. Diesel PM Control Technology Demonstration Program for Stationary Applications

As discussed earlier, there are a number of potentially effective emission control technologies that can be used to reduce diesel PM emissions from diesel-fueled engines. To further investigate the effectiveness of these technologies for stationary diesel-fueled engine applications, ARB under took a demonstration program. The stationary engine control device demonstration was performed in conjunction with a California Energy Commission Back-up Generator Program. (CEC, 2001) The demonstration included testing of backup generators for baseline emission levels, retrofitting selected engines with commercially available diesel PM control devices, and testing controlled emission levels. Emissions were tested for PM, total hydrocarbons (THC), methane, nonmethane hydrocarbons (NMHC), $CO_2$, CO, $NO_x$, $NO_2$ using ISO 8178 1992-05-25 Parts 1, 2 and 4 testing procedures. (ISO/DP 1878, 1992) A five-mode D2 test cycle was used in all emission testing. The program was designed to support the testing and data requirements for control device verification under ARB's Verification Procedure. To support verification, the test protocol included baseline and initial control efficiency testing. Durability and post-durability control efficiency are currently in progress. Emission testing was performed by University of California, Riverside, Bourns College of Engineering-Center for Environmental Research and Testing (UCR CE-CERT) under the direction of Wayne Miller, Ph.D. Additional details on the demonstration program are provided in Appendix H.

Control Technologies

Diesel PM control technologies were selected for demonstration based on a number of criteria: projected diesel PM control efficiencies, commercial availability, demonstrated infield use, willingness of manufacturer to complete the verification process, and product cost. Devices were selected that were projected to meet varying levels of diesel PM control. Technologies included emulsified diesel fuel, diesel oxidation catalysts, flow through filter technology, and both active and passive particulate filters. When recommended by the control technology manufacturers, fuel-borne catalysts were used to enhance or promote regeneration. The control device technologies that were tested are described in Table VI-6.

**Table VI-6: Control Strategies Included in Demonstration Program**

| Control Device Manufacturer | Product | Product Description |
|---|---|---|
| Lubrizol-Engine Control Systems | Sequentially Regenerated Combifilter | Triple bank silicon carbide particulate filter with online filter regeneration by electrical heating (Active DPF). |
| Johnson Matthey | Continuously Regenerating Trap (CRT) | Catalyzed diesel particulate filter (Passive DPF). |
| Sud Chemie | SC-DOC | Diesel Oxidation Catalyst (DOC 1). |
| CleanAir Systems Flow-Thru-Filter System and Clean Diesel Technologies (CDT) Fuel-Borne Catalyst | Flow-Thru-Filter System combined with CDT Fuel-Borne Catalyst | Combined system includes a DOC, flow through filter used with a CDT fuel-borne catalyst. The flow through filter component was removed prior to testing due to lower than required exhaust temperatures (DOC with Fuel-Borne Catalyst or DOC/FA). |
| Chevron | Proformix Fuel | Water emulsified fuel (20% water emulsification) utilizes Lubrizol's PuriNOx™ technology (Emulsified Fuel). |
| Catalytic Exhaust Products Particulate Filter and Clean Diesel Technologies Fuel-Borne Catalyst | SXS-B/FA combined with CDT Fuel-Borne Catalyst | Uncatalyzed diesel particulate filter used with a CDT fuel-borne catalyst (Particulate Filter with Fuel-Borne Catalyst). |

Results from the Demonstration Program

Active and passive diesel particulate filters, diesel oxidation catalysts, and emulsified diesel fuel technologies were tested for generator applications. Emission testing was conducted according to ISO-8178 test procedures using the D2 test cycle. The results from the testing are presented in Table VI-7. As can be seen, the D2 weighted emission factors and diesel PM control efficiencies for both active and passive DPF technologies were better than 90 percent. The technologies were capable of regenerating under the intermittent cold start maintenance cycling and loaded operation, typical for backup generators. While the passive CRT DPF did have increased levels of $NO_2$, overall NOx levels decreased for both active and passive DPFs. The actively regenerating system showed better than 99 percent reduction for diesel PM, with regeneration independent of exhaust temperature by design. For the active DPF system, issues involving high backpressure levels and active regeneration control design were identified and will be addressed during future system design for stationary sources. The results from the demonstration testing indicate that both active and passive technologies are effective in reducing diesel PM better than 85 percent.

The effectiveness of diesel oxidation catalysts reportedly depends on the level of soluble organic fraction in the exhaust PM relative to the elemental carbon fraction (EC/OC ratio). Comparison testing on two engines showed that for low ratios of organic diesel PM components, diesel PM control effectiveness was lower than anticipated. Where the ratio of organic components was higher, the control efficiency increased significantly. Testing of two commercially available DOC technologies on a 1985 two-stroke Detroit Diesel V92 showed control efficiencies in the range of 40 to 46 percent for diesel PM and 53 to 69 for NMHC. There were slight NOx increases, less than 10 percent, that may be attributed to differences in ambient conditions during testing. Demonstration testing indicates that DOC technologies are effective in providing better than 30 percent PM control efficiency for appropriate engine types.

Testing of emulsified fuels for two different Caterpillar engines resulted in a wide range of control efficiency for diesel PM, ranging between 18 to 73 percent. Control efficiencies for NMHC were even more varied, ranging from a decrease of 60 percent to an increase of 12 percent. For both tests, NOx reductions ranged from 3 to 14 percent. These wide variations in test results indicate that further testing is required, but for certain engine types, emulsified fuel could be a very effective technology to reduce diesel PM significantly, while also providing reductions in NOx.

In conclusion, ARB staffs believe the results of the control device demonstrations indicate that diesel PM control technologies are available to provide a wide range of reduction levels for appropriate engines and applications. Durability testing of the DPF and DOC systems for intermittent cold start and extended high load operation indicates that these technologies are effective for generator applications and may be effective for other steady-state stationary engine applications, as well. Each of the tested technologies is currently commercially available for retrofit applications.

**Table VI-7: Summary of D2 Weighted Emission Factors and Control Efficiencies**

| | | Average D2 Weighted Emission Factors (gm/bhp-hr) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Configuration** | **Fuel** | **100% Load (HP)** | **THC** | **$CH_4$** | **NMHC** | **CO** | **NOx** | **PM** |
| 2000 CAT 3406C with Johnson Matthey CRT Passive DPF | | | | | | | | |
| Baseline | CARB Diesel | 465.9 | 0.087 | 0.015 | 0.074 | 1.041 | 6.608 | 0.142 |
| Controlled | ULSD | 467.1 | 0.007 | 0.003 | 0.004 | 0.228 | 6.212 | 0.012 |
| Percent Reductions | | | 92.3 | 82.6 | 94.1 | 78.1 | 6.0 | 91.4 |
| 2000 CAT 3406C with ECS Sequentially Regenerated Combifilter Active DPF | | | | | | | | |
| Baseline | CARB Diesel | 465.0 | 0.082 | 0.017 | 0.067 | 1.468 | 6.783 | 0.159 |
| Controlled | ULSD | 458.8 | 0.050 | 0.015 | 0.037 | 1.645 | 6.042 | 0.0003 |
| Percent Reductions | | | 39.5 | 16.1 | 44.7 | -12.1 | 10.9 | 99.8 |
| 1985 2 stroke Detroit Diesel V92 with CleanAir Systems DOC and CDT Fuel-Borne Catalyst | | | | | | | | |
| Baseline | CARB Diesel | 389.6 | 0.659 | 0.053 | 0.613 | 1.715 | 10.785 | 0.201 |
| Controlled | ULSD+FBC | 389.6 | 0.200 | 0.014 | 0.188 | 0.100 | 11.545 | 0.121 |
| Percent Reductions | | | 69.6 | 73.0 | 69.3 | 94.1 | -7.0 | 40.0 |
| 2000 CAT 3406C with Sud Chemie DOC | | | | | | | | |
| Baseline | CARB Diesel | 465.0 | 0.082 | 0.017 | 0.067 | 1.468 | 6.783 | 0.159 |
| Controlled | CARB Diesel | 467.7 | 0.011 | 0.002 | 0.009 | 0.058 | 7.168 | 0.129 |
| Percent Reductions | | | 86.7 | 90.3 | 85.9 | 96.0 | -5.7 | 18.8 |
| 1985 2 stroke Detroit Diesel V92 with Sud Chemie DOC | | | | | | | | |
| Baseline | CARB Diesel | 389.6 | 0.659 | 0.053 | 0.613 | 1.715 | 10.785 | 0.201 |
| Controlled | CARB Diesel | 393.5 | 0.307 | 0.022 | 0.288 | 0.206 | 10.860 | 0.107 |
| Percent Reductions | | | 53.4 | 58.2 | 53.1 | 88.0 | -0.7 | 46.9 |
| 1986 CAT 3406B with Emulsified Diesel | | | | | | | | |
| Baseline | CARB Diesel | 399.3 | 0.147 | 0.027 | 0.124 | 0.679 | 11.321 | 0.093 |
| Controlled | Emulsified Fuel | 363.1 | 0.161 | 0.026 | 0.139 | 0.496 | 10.914 | 0.076 |
| Percent Reductions | | | -9.7 | 2.4 | -12.0 | 27.0 | 3.6 | 17.8 |
| Post- 96 CAT 3406C with Emulsified Diesel | | | | | | | | |
| Baseline | CARB Diesel | 469.0 | 0.163 | 0.031 | 0.270 | 1.234 | 6.512 | 0.150 |
| Controlled | Emulsified Fuel | 469.0 | 0.131 | 0.027 | 0.108 | 0.820 | 5.563 | 0.041 |
| Percent Reductions | | | 19.4 | 13.1 | 60.0 | 33.6 | 14.6 | 72.7 |

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## VII. REGULATORY ALTERNATIVES

ARB staff evaluated four alternative strategies to the current proposal. Based on the analysis, none of the alternative control strategies were considered more effective than the proposed regulation. Full implementation of the proposed regulation is necessary to achieve ARB's goal, as described in the Diesel Risk Reduction Plan, to reduce by 85 percent diesel PM emissions and associated potential cancer risks by 2020. (ARB, 2000) The proposed regulation provides owners or operators of stationary diesel-fueled CI engines with flexibility in determining the most cost-effective control strategy that will meet the proposed emission standards and operational requirements for their operation.

### A. Do Not Adopt This Regulation

With full implementation of the proposed regulation, the estimated reduction in diesel PM is approximately 80 percent in 2020 relative to the 2002 baseline from stationary engines used in non-agricultural applications. The recommended control options should reduce diesel PM emissions to the lowest level achievable through the application of best available control technology or a combination of one or more effective control methods. These estimated reductions in diesel PM are an important element in the Diesel Risk Reduction Plan, and along with other control measures to be adopted by the ARB will contribute to reducing cancer and noncancer health risks to the public associated with inhalation exposure to emissions of diesel PM. Short-term exposure to diesel PM emissions may cause acute or chronic noncancer respiratory effects such as irritation of the eyes, throat, and bronchial passages. It has also been concluded that inhalation of diesel PM emissions can cause neurophysiological symptoms such as lightheadedness or nausea. Additional benefits of the proposed regulation would be a reduction in acute or chronic noncancer health effects associated with inhalation exposure to diesel PM emissions.

The ARB is required by H&SC Section 39658 to establish ATCMs for TACs. Further, H&SC Section 39666 requires the ARB to adopt ATCMs to reduce emissions of TACs from nonvehicular sources. In consideration of ARB's statutory requirements and the recognized potential for adverse cancer and noncancer health impacts to the public resulting from inhalation exposure to diesel PM, this alternative is not a reasonable option.

### B. Rely on New Engine Standards

Another alternative would be to rely on existing governmental programs. Beginning in 1996, manufacturers and vendors of diesel engines have been subject to U.S. EPA's nonroad diesel emission regulations (40 CFR Part 89). The standards are tiered and the date upon which each tier takes effect depends on the engine size. As of January 1, 2000, all engine sizes were subject to Tier 1 standards. (SCAQMD, 2003) Recently, the U.S. EPA proposed new engine standards (Tier 4) for nonroad diesel engines that would take effect in 2008 and would include stringent emission standards for PM, NOx, and SOx, pollutants which contribute to adverse public health impacts. In addition, U.S. EPA's proposed rule would require nonroad diesel engines to use diesel fuel with a maximum sulfur content of 500 ppm in 2007 and 15 ppm in 2010. (EPA, 2003) California has harmonized its new engine standards for off-road diesel engines with the proposed U.S. EPA nonroad standards. While technically these requirements do not extend to "stationary" engines, manufacturers have indicated they generally sell certified off-road engines for stationary use, and the benefits of the nonroad standards could be extended to new stationary CI engines.

However, the U.S. EPA's proposed Tier 4 new engine standards do not address existing in-use diesel engines, and the new standards would be implemented on a phased-in schedule based on engine size beginning in 2008 through 2014. Additionally, the proposed federal standards offer various alternatives to demonstrate (use of emission reduction credits) or delay compliance to a certain phase-in schedules. These critical implementation measures will not produce the greatest potential reductions in diesel PM emissions in the shortest timeframe. Further, the long useful life of diesel engines and the lack of stringent standards for in-use nonroad diesel engines will significantly limit the potential reduction in ambient concentrations of diesel PM and associated cancer and noncancer health risks. ARB staff does not recommend this alternative because it would result in less reduction in diesel PM emissions and greater potential cancer risk than the proposed ATCM.

### C. Rely on Local Regulations

In general, local and regional authorities have the primary responsibility for control of air pollution from all sources other than emissions from motor vehicles (H&SC Section 40000). However, H&SC 93113(b) directs the ARB to regulate non-vehicle engines, which include stationary diesel-fueled engines. California air pollution control districts or air quality management districts (air districts) have established two permitting programs that control emissions from new, modified, or existing stationary sources. New or modified stationary sources are subject to federal and or local New Source Review (NSR) permitting requirements for nonattainment pollutants and their precursors. Existing stationary sources that emit nonattainment pollutants or their precursors are also subject to retrofit control requirements based on the best or reasonably available retrofit control technology. Several air districts have source-specific regulations affecting existing stationary diesel engines; however, the majority of them primarily address NOx emissions and typically exempt engines used as emergency standby engines.

Currently, at least eight air districts have adopted toxic NSR rules and many more have adopted toxic NSR permitting policies or procedures. During the development of California's Diesel Risk Reduction Plan, the ARB staff and air districts agreed that the best approach to controlling and reducing the potential adverse health risks from diesel PM is through the development of source-specific ATCMs. In this manner, each activity (e.g., on-road, off-road, marine, agricultural, etc.) would be consistently regulated throughout California, taking into account each activity's uniqueness. Because of the potential for inconsistent regulation of stationary diesel-fueled engines, reliance on local regulations is not considered a viable option.

### D. Mandate 85 Percent Reductions from All Diesel-fueled CI Engines

This alternative considers requiring all diesel-fueled CI engines to achieve a minimum of 85 percent reduction from baseline emissions of diesel PM. The proposed emission reduction goal would be characterized as a performance standard in this regulation; thus, it could be met by a variety of emission control strategies. Costs of implementing this proposal would vary based on the control strategy chosen by each newly regulated source, e.g., singular emission control device, or a combination of control devices, hours of operation, and/or alternative fuels. While the emission benefits would be approximately twice as much as in this proposal, the cost for this alternative would be about four to five times greater. Therefore, this option is not considered feasible due to the high costs and fiscal impact associated with its full implementation.

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# VIII. ENVIRONMENTAL IMPACTS

This chapter describes the potential environmental impacts of this proposed ATCM. This proposed ATCM is intended to protect the health of California's citizens by reducing exposure to stationary diesel engine emissions. An additional consideration is the impact that implementation of the proposed ATCM may have on the environment. Based upon available information, the ARB staff has determined that no significant adverse environmental impacts should occur as the result of adopting the proposed ATCM. This chapter describes the potential impacts that the proposed ATCM may have on wastewater treatment, hazardous wasted disposal, and air quality.

## A. Legal Requirements

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential environmental impacts of proposed regulations. Because the ARB's program involving the adoption of regulations has been certified by the Secretary of Resources pursuant to Public Resources Code section 21080.5, the CEQA environmental analysis requirements may be included in the Initial Statement of Reasons (ISOR) for this rulemaking. In the ISOR, ARB must include a "functionally equivalent" document, rather than adhering to the format described in CEQA of an Initial Study, a Negative Declaration, and an Environmental Impact Report. In addition, staff will respond, in the Final Statement of Reasons for the ATCM, to all significant environmental issues raised by the public during the public review period or at the Board public hearing.

Public Resources Code section 21159 requires that the environmental impact analysis conducted by ARB include the following:

- An analysis of reasonably foreseeable environmental impacts of the methods of compliance;
- An analysis of reasonably foreseeable feasible mitigation measures; and
- An analysis of reasonably foreseeable alternative means of compliance with the ATCM.

Compliance with the proposed ATCM is expected to directly affect air quality and potentially affect other environmental media as well. Our analysis of the reasonable foreseeable environmental impacts of the methods of compliance is presented below.

Regarding mitigation measures, CEQA requires an agency to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental impacts described in the environmental analysis.

The proposed ATCM is needed to reduce the risk from exposures to diesel PM as required by Health and Safety Code (H&SC) section 39666 and to fulfill the goals of the Diesel Risk Reduction Plan. Alternatives to the proposed ATCM have been discussed earlier in Chapter VII of this report. ARB staff have concluded that there are no alternative means of compliance with the requirements of H&SC section 39666 that would achieve similar diesel PM emission reductions at a lower cost.

## B. Effects on Air Quality

The proposed ATCM will provide diesel PM emissions reductions throughout California, especially in urban areas and those areas non-attainment for the State and federal ambient air quality standards for $PM_{10}$ and $PM_{2.5}$. Air quality benefits will result from the reduction of NOx, ROG, and CO emissions as well. The projected controlled emissions from stationary diesel-fueled engines are presented in Table VIII-1.

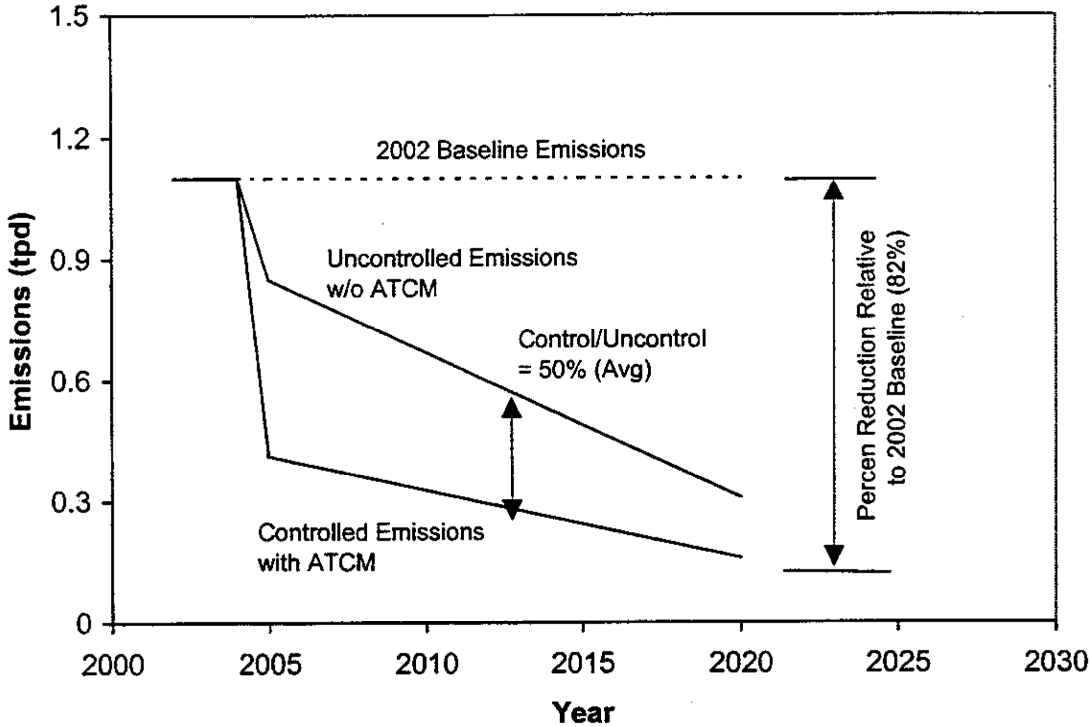
**Table VIII-1: Projected Annual Emissions for Stationary Engines Used in Non-Agricultural Applications with Implementation of the Proposed ATCM***

| | 2002 Emissions (Tons per Day) | | | | 2010 Emissions (Tons per Day) | | | | 2020 Emissions (Tons per Day) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Category** | **PM** | **NOx** | **ROG** | **CO** | **PM** | **NOx** | **ROG** | **CO** | **PM** | **NOx** | **ROG** | **CO** |
| Prime | 0.8 | 13.8 | 1.3 | 4.8 | 0.1 | 8.5 | 0.5 | 1.6 | 0.1 | 2.9 | 0.3 | 1.2 |
| Emergency Standby | 0.3 | 6.4 | 0.5 | 2.1 | 0.2 | 4.6 | 0.3 | 1.4 | 0.1 | 2.5 | 0.2 | 1.2 |
| Total | 1.1 | 20.2 | 1.8 | 6.9 | 0.3 | 13.1 | 0.8 | 3.0 | 0.2 | 5.4 | 0.5 | 2.4 |

* We do not have projected ATCM-impacted emission estimates for agricultural engines at this time.

ARB staff estimates that, with implementation of the proposed ACTM, diesel PM emissions from stationary diesel-fueled non-agricultural engines will be reduced by approximately 0.9 tons per day in 2020, relative to 2002 baseline levels. As shown in figure VIII-1, this is about an 80 percent reduction from the 2002 baseline. Of this, about 50 percent can be attributed to the ATCM.

**Figure VIII-1: Projected Diesel PM Emissions with and without the ATCM**




Between 2005 and 2020, we estimate approximately 1,710 tons of PM will be removed from California's air as a result of the ATCM. As shown in Table VIII-2, ARB staff estimates that, as older engines are replaced with new engines or retrofitted with DECS, there will also be a reduction in NOx of approximately 790 tons per year (2.2 tons per day) and 106 tons per year (0.3 tons per day) reduction in ROG in the same time frame.

**Table VIII-2: Emission Benefits from Implementation of the Proposed ATCM**

| | PM | NOx | ROG | CO |
|---|---|---|---|---|
| **Emissions Removed 2005 to 2020 (Tons)** | 1,710 | 12,640 | 1,700 | 6,590 |
| **Annual Average Reductions (Tons per Year)** | 107 | 790 | 106 | 410 |

Figure VIII-2 illustrates the emissions reductions associated with the implementation of the ATCM for diesel PM and ROG. Figure VIII-3 illustrates the emissions reductions associated with the implementation of the ATCM for NOx and CO.

Figure VIII-2: PM and ROG Emission Reductions Attributable to the ATCM for Non-Agricultural Engines

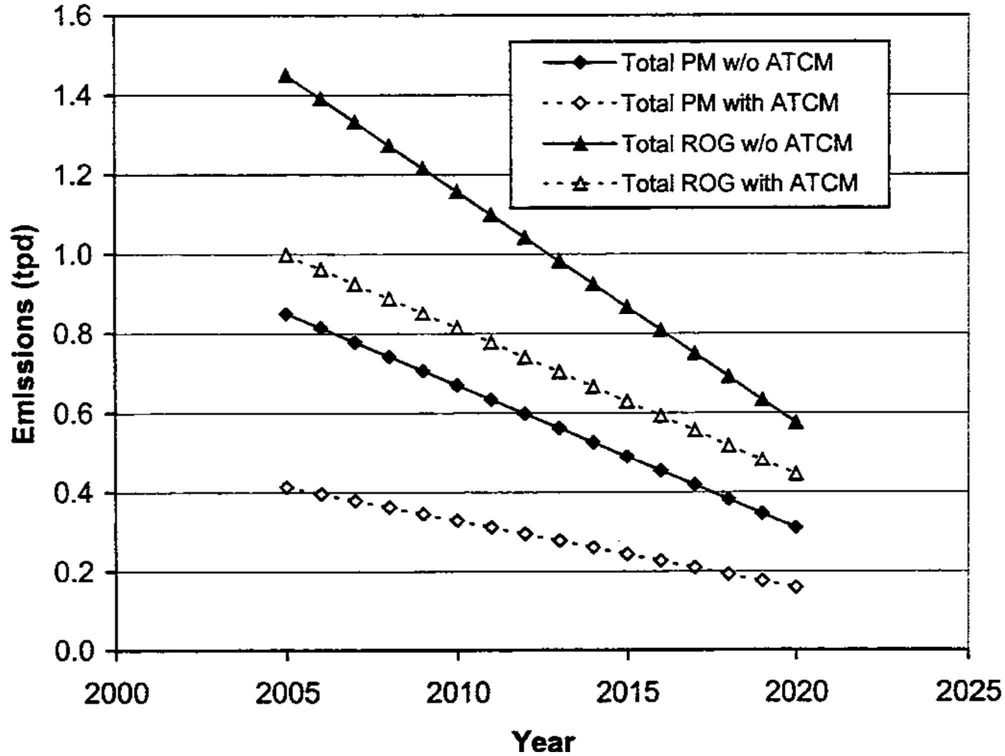
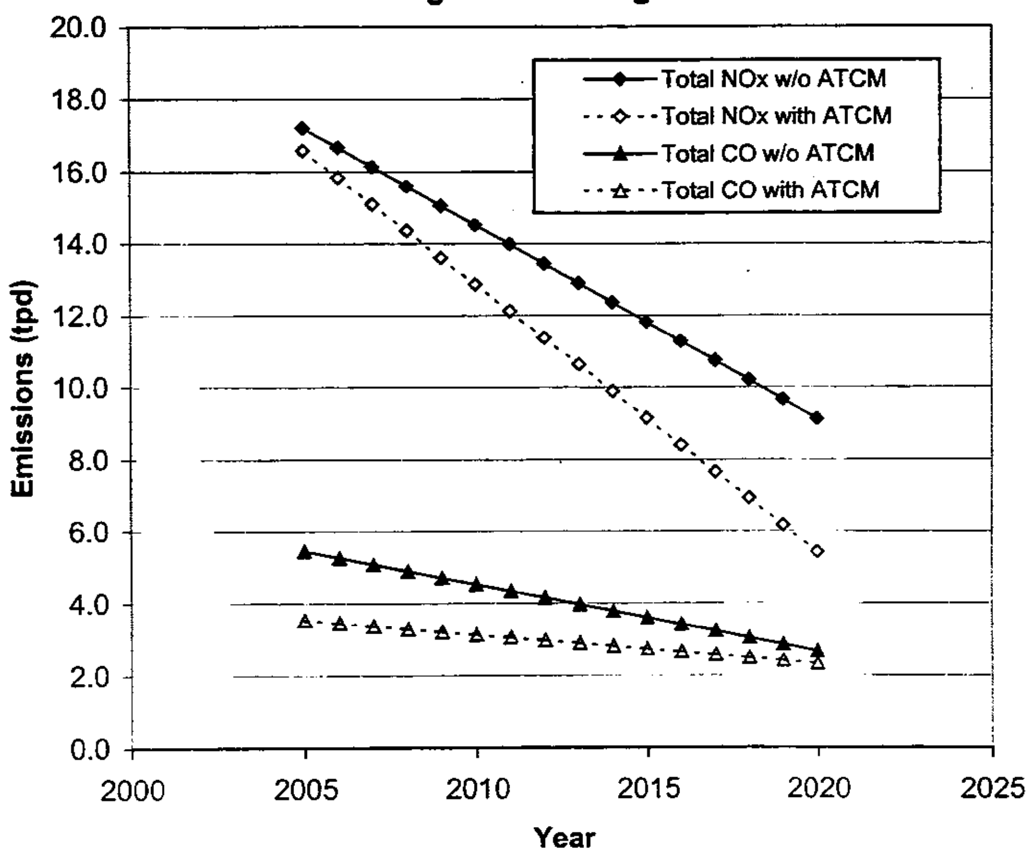



Figure VIII-3: NOx and CO Emission Reductions Attributable to the ATCM for Non-Agricultural Engines



### C. Health Benefits of Reductions of Diesel PM Emissions

The emission reductions obtained from this regulation will result in lower ambient PM levels and significant reductions of exposure to primary and secondary diesel PM. Lower ambient PM levels and reduced exposure, in turn, would result in a reduction of the prevalence of the diseases attributed to PM and diesel PM including, reduced incidences of hospitalizations for cardio-respiratory disease, and prevention of premature deaths.

<u>Primary Diesel PM</u>

Lloyd and Cackette estimated that, based on the Krewski *et al.* study[14], diesel $PM_{2.5}$ exposures at level of 1.8 $\mu g/m^3$ resulted in a mean estimate of 1,985 cases of premature deaths per year in California. (Lloyd/Cackette, 2001) The diesel PM emissions corresponding to the direct diesel ambient population-weighted PM concentration of 1.8 $\mu g/m^3$ is 28,000 tons per year. (ARB, 2000) Based on this information, we estimate that reducing 14.11 tons per year of diesel PM emissions would result in one fewer premature death (28,000 tons/1,985 deaths). Comparing the $PM_{2.5}$ emission before and after this regulation, the proposed regulation is expected to reduce emissions by 1,713 tons at the end of year 2020, and therefore prevent an estimated 121 premature deaths (60-185, 95 percent confidence interval (95 CI)) by year 2020. *Prior to 2020, cumulatively, it is estimated that 60 premature deaths* (29-90, 95 CI) would be avoided by 2010 and 97 (48-146, 95 CI) by 2015.

If we multiply 14.11 tons of diesel PM emissions by the average present value of cost-effectiveness of $7.67 per pound PM (or $15,340 per ton; see Chapter IX) the estimated *cost of control per premature death prevented is about $216,447 in 2002 dollars.* The U. S. EPA has established $6.3 million (in year 2000 dollars) for a 1990 income level as the mean value of avoiding one death. (EPA, 2003) As real income increases, the value of a life may rise. U.S. EPA further adjusted the $6.3 million value to $8 million (in 2000 dollars) for a 2020 income level. Assuming that real income grew at a constant rate from 1990 and will continue at the same rate to 2020, we adjusted the value of avoiding one death for the income growth. Since the control cost is expressed in 2002 discounted value, accordingly, we discounted values of avoiding a death in the future back to the year 2002. In U.S. EPA's guidance of social discounting, it recommends using both three and seven percent discount rates. (EPA, 2000) Using these rates, and the annual avoided deaths as weights, the weighted average value of reducing a

[14] Although there are two mortality estimates in the report by Lloyd and Cackette – one based on work by Pope *et al.* and the other based on Krewski *et al.*, we selected the estimate based on the Krewski's work. For Krewski *et al.*, an independent team of scientific experts commissioned by the Health Effects Institute conducted an extensive reexamination and reanalysis of the health effect data and studies, including Pope *et al.* The reanalysis resulted in the relative risk being based on changes in mean levels of $PM_{2.5}$, as opposed to the median levels from the original Pope *et al.* study. The Krewski *et al.* reanalysis includes broader geographic areas than the original study (63 cities vs. 50 cities). Further, the U.S. EPA has been using Krewski's study for its regulatory impact analyses since 2000. (Krewski, 2000) (Pope, 1995)

future premature death discounted back to year 2002 is $4.4 million at seven percent discount rate, and $6 million at three percent. The cost per death avoided because of this proposed regulation is 20 to 28 times lower than the U.S. EPA's benchmark for value of avoided death. This rule is, therefore, a cost-effective mechanism to reduce premature deaths that would otherwise be caused by diesel PM emissions without this regulation.

The benefits of reducing diesel emissions are based on a statewide average diesel emission value, such as in the Lloyd and Cackette analysis, which contains off-road emissions from a number of categories that occur well away from population centers. Stationary diesel-fueled engines and their diesel emissions are more concentrated in urban areas, thus a greater reduction of the emissions as a result of the regulation are expected to occur in urban areas, as compared to rural areas. Emission reductions are, therefore, likely to have greater benefits than those estimated by Lloyd and Cackette. Thus, the proposed rule is likely more cost-effective than the above estimate would suggest.

Secondary Diesel PM

Lloyd and Cackette also estimated that indirect diesel $PM_{2.5}$ exposures at a level of 0.81 $\mu g/m^3$ resulted in a mean estimate of 895 additional premature deaths per year in California, above those caused by directly emitted formed diesel PM. The NOx emission levels corresponding to the indirect diesel ambient PM concentration of 0.81 $\mu g/m^3$ is 1,641 tpd (598,965 tpy). Following the same approach as above, we estimate that reducing 669 tons of NOx emissions would result in one fewer premature death (598,965 tons/895 deaths). Therefore, with the 12,645-ton reduction of NOx that is expected by the end of 2020, an estimated 19 deaths would be avoided.

If we multiply 669 tons of NOx emissions by the average present value of cost-effectiveness of $0.75 per pound NOx (or $1,500 per ton, see Chapter IX), the estimated cost of control per premature death prevented is about $1 million. The cost is again lower than the U.S. EPA's present value of an avoided death by four to six times.

Reduced Ambient Ozone Levels

Emissions of NOx and ROG are precursors to the formation of ozone in the lower atmosphere. Exhaust from diesel engines contributes a substantial fraction of ozone precursors in any metropolitan area. Therefore, reductions in NOx and ROG from diesel engines would make a considerable contribution to reducing exposures to ambient ozone. Controlling emissions of ozone precursors would reduce the prevalence of the types of respiratory problems associated with ozone exposure and would reduce hospital admissions and emergency visits for respiratory problems.

## D. Reasonably Foreseeable Environmental Impacts as a Result of Potential Compliance Methods

We have identified potential adverse environmental impacts from the use of diesel oxidation catalysts (DOCs) and diesel particulate filters (DPFs). These include a potential increase in sulfate PM, a potential increase in $NO_2$ from some DPFs, and the potential for creating hazardous wastes. As described below, options are available to mitigate these potential adverse impacts.

### Diesel Oxidation Catalyst (DOC)

Two potential adverse environmental impacts of the use of diesel oxidation catalysts have been identified. First, as is the case with most processes that incorporate catalytic oxidation, the formation of sulfates increases at higher temperatures. Depending on the exhaust temperature and sulfur content of the fuel, the increase in sulfate particles may offset the reductions in soluble organic fraction emissions. Using low sulfur diesel fuel can minimize this effect. Second, a diesel oxidation catalyst could be considered a "hazardous waste" at the end of its useful life depending on the materials used in the catalytic coating. Because catalytic converters have been used on gasoline powered on-road vehicles for many years, there is a very well-established market for these items (see, for example, http://www.pacific.recycle.net – an Internet posting of buyers and sellers of various scrap materials). In the recycling process, the converters are broken down, and the metal is added to the scrap-metal stream for recycling, while the catalysts (one or a combination of the platinum group metals) are extracted and reused.

Because of platinum's high activity as an oxidation catalyst, it is the predominant platinum group metal used in the production of diesel oxidation catalysts. There is a very active market for reclaimed platinum for use in new catalytic converters, jewelry, fuel cells, cathode ray tube screens, catalysts used during petroleum refining operations, dental alloys, oxygen sensors, platinum electrode spark plugs, medical equipment, and platinum-based drugs for cancer treatment, to name a few. (Kendall, 2002) (Kendall, 2003)

### Catalyzed Diesel Particulate Filters

These devices are composed of a ceramic diesel particulate filter along with a platinum catalyst to catalyze the oxidation of carbon-containing emissions and significantly reduce diesel PM emissions. This is an obvious positive environmental impact.

However, there are also inorganic solid particles present in diesel exhaust, which are captured by diesel particulate filters. These inorganic materials are metals derived from engine oil, diesel fuel, or engine wear and tear. While the PM filter is capable of capturing inorganic materials, these materials are not oxidized into a gaseous form and expelled.

Because these materials would otherwise be released into the air, the filters are benefiting the environment by capturing these metallic particles, known as "ash." However, the ash that is collected in the PM filter must be removed from the filter periodically to maintain the filter's effectiveness.

Ash collected from a diesel engine using a typical lubrication oil and no fuel additives has been analyzed and is primarily composed of oxides of the following elements: calcium, zinc, phosphorus, silicon, sulfur, and iron. Zinc is the element of primary concern because, if present in high enough concentration, it can make a waste a hazardous waste. Title 22, CCR, section 66261.24 establishes two limits for zinc in a waste: 250 milligrams per liter for the Soluble Threshold Limit Concentration and 5,000 milligrams per kilogram for the Total Threshold Limit Concentration. The presence of zinc at or above these levels would cause a sample of ash to be characterized as a hazardous waste.

Under California law, it is the generator's responsibility to determine whether their waste is hazardous or not. Applicable hazardous waste laws are found in the H&SC, division 20; title 22, CCR, division 4.5; and title 40 of the Code of Federal Regulations. Staff recommends owners that install a diesel particulate filter on an engine to contact both the manufacturer of the diesel emission control system and the California Department of Toxic Substances Control (DTSC) for advice on proper waste management.

ARB staff has consulted with personnel of the DTSC regarding management of the ash from diesel particulate filters. DTSC personnel have advised ARB that it has a list of facilities that accept waste from businesses that qualify as a conditionally exempt small quantity generator. Such a business can dispose of a specific quantify of hazardous waste at certain Household Hazardous Waste events, usually for a small fee. An owner who does not know whether or not he qualifies or who needs specific information regarding the identification and acceptable disposal methods for this waste should contact the California DTSC.[15]

Additionally, the technology exists to reclaim zinc from waste. For example, the Swedish company MEAB has developed processes for extracting zinc and cadmium from various effluents and industrial waste streams. Whether reclamation for reuse will be economically beneficial remains to be seen. (MEAB, 2003)

Because of the time and costs associated with filter maintenance, there are also efforts by industry to reduce the amount of ash formed. Most of the ash is formed from the inorganic materials in engine oil, particularly from zinc-containing additives necessary to control acidification of engine oil – due in part to sulfuric acid derived from sulfur in diesel fuel. As the sulfur content of diesel fuel is decreased, the need for acid neutralizing additives in engine oil should also decrease. A number of technical programs are ongoing to determine the impact of changes in oil ash content and other

[15] Information can be obtained from local duty officers and from the DTSC web site at http://www.dtsc.ca.gov.

characteristics of engine oil on exhaust emission control technologies and engine wear and performance.

It may also be possible to reduce the ash level in diesel exhaust by reducing oil consumption from diesel engines. Diesel engine manufacturers over the years have reduced engine oil consumption in order to reduce PM emissions and to reduce operating costs for engine owners. Further improvements in oil consumption may be possible in order to reduce ash accumulation rates in diesel particulate filters.

In addition, measurements of NOx emissions for heavy-duty diesel vehicles equipped with passive catalyzed filters have shown an increase in the $NO_2$ portion of total NOx emissions, although the total NOx emissions remain approximately the same. In some applications, passive catalyzed filters can promote the conversion of nitrogen oxide (NO) emissions to $NO_2$ during filter regeneration. More $NO_2$ is created than is actually being used in the regeneration process; and the excess is emitted. The $NO_2$ to NOx ratios could range from 20 to 70 percent, depending on factors such as the diesel particulate filter systems, the sulfur level in the diesel fuel, and the duty cycle. (DaMassa, 2002)

Formation of $NO_2$ is a concern because it irritates the lungs and lowers resistance to respiratory infections. Individuals with respiratory problems, such as asthma, are more susceptible to the effects. In young children, nitrogen dioxide may also impair lung development. In addition, a higher $NO_2$/NOx ratio in the exhaust could potentially result in higher initial NO2 concentrations in the atmosphere which, in turn, could result in higher ozone concentrations.

Model simulations have shown that a $NO_2$ to $NO_X$ emission ratio of approximately 20 percent would nearly eliminate any impact of increased $NO_2$ emissions. (DaMassa, 2002). According to the model, at the $NO_2$ to NOx ratio of 20 percent, there will be a decrease of the 24-hour ozone exposure (greater than 90 parts per billion) by two percent while an increase of the peak 1-hour $NO_2$ by six percent (which is still within the $NO_2$ standard).

The health benefits derived from the use of PM filters are immediate and offset the possible adverse effects of increases in $NO_2$ emissions. For this reason, a cap of 20 percent $NO_2$ to NOx emission ratio was established for all diesel emission control systems through ARB's Verification Procedure. ARB staff believes most prime engine operators will choose to install verified systems on their engines. For these engines, the 20 percent $NO_2$ to NOx emission ratio can be met. There is the potential, however, for the use of systems that exceed the 20 percent cap. Both ARB and the district will monitor this and determine if any additional requirements need to be incorporated into the ATCM.

Alternative Fuels

As discussed in Chapter VI, a number of alternative fuels and alternative diesel fuels show great promise in their potential to reduce diesel PM emissions. These include biodiesel, Fischer-Tropsch fuels, and alternative fuels such as natural gas. No significant negative environmental impacts have been determined from the use of alternative fuels. With respect to alternative diesel fuels, there may be a slight increase in NOx emissions as a result of biodiesel use. (Hofman and Solseng, 2002)

To ensure there are no adverse impacts from the use of alternative diesel fuels, the proposed ATCM requires any alternative diesel-fuel or fuel additives used in a stationary diesel-fueled engine to be verified under the ARB's Verification Procedure. The Verification Procedure permits verification only if a multimedia evaluation of the use of the alternative diesel fuel or additive has been conducted. In addition, verification requires a determination by the California Environmental Policy Council that such use will not cause a significant adverse impact on public health or the environment pursuant to H&SC section 43830.8 (see Public Resource Code, section 71017).

## E. Reasonably Foreseeable Mitigation Measures

ARB staff has concluded that no significant adverse environmental impacts should occur from adoption of and compliance with the proposed ATCM. Therefore, no mitigation measures would be necessary.

## F. Reasonably Foreseeable Alternative Means of Compliance with the Proposed Airborne Toxic Control Measure

Alternatives to the proposed ATCM are discussed in Chapter VII of this report. ARB staff has concluded that the proposed ATCM provides the most effective and least burdensome approach to reducing children's and the general public's exposure to diesel PM and other air pollutants emitted from diesel-fueled stationary engines.

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# IX. ECONOMIC IMPACTS

In this chapter, we present the estimated costs and economic impacts associated with implementation of the proposed ATCM for stationary engines. The expected capital and recurring costs for potential compliance options are presented, as well as an analysis of the cost effectiveness of the ATCM. The cost effectiveness is calculated two ways, as the cost in dollars per pound of diesel PM reduced and also as the cost in dollars per pound of combined ROG + NOx reduced. The costs and associated economic impacts are presented for private companies, as well as governmental agencies.

## A. Summary of the Economic Impacts

ARB staff estimates the cost of the ATCM to affected businesses and government agencies to be approximately 47 million dollars for the total capital costs. This corresponds to 8.4 million dollars annually over the useful lift of the control equipment. This cost represents the capital cost of equipment, purchased in 2005 and 2011 using 2002 dollars, annualized over the useful life of the emission control equipment plus the annual recurring costs or savings. ARB does not have data to determine multiple engine ownership and associated engine ages to accurately determine the retrofit phase in schedule. These costs were not brought back to net present value, and the diesel emission control equipment was not phased in over four years. Instead, we assumed the equipment to be purchased at the beginning of the ATCM implementation. This method results in a conservative cost estimate and was used to estimate near term (i.e., 1-3 years) fiscal impacts.

The useful life of the control equipment depends on the number of hours the engine is expected to operate annually. For prime engines, the useful life ranges from 4 to 25 years with a 10-year average. For emergency standby engines, the expected useful life is 25 years.

As shown in Table IX-1, the majority of the costs will be borne by prime engine owners, while in many cases, owners of emergency standby engines will have no cost or net savings due to the reduced operating hours. We estimate that only a small number of emergency standby engines will need to install diesel emission controls (DECS).

Table IX-1: Summary of Annual Costs for the Proposed ATCM

| Engine Application | Category | Total Capital Cost | Annualized Capital Cost | Annual Recurring Costs ($) | Total Annualized Cost ($) |
|---|---|---|---|---|---|
| Emergency Standby | Private | $2,296,000 | $163,000 | -$123,000 | $40,000 |
| | State | $199,000 | $14,000 | -$111,000 | -$97,000 |
| | City | $370,000 | $26,000 | -$13,000 | $14,000 |
| | County | $192,000 | $14,000 | -$20,000 | -$7,000 |
| | Other Local | $397,000 | $28,000 | -$71,000 | -$43,000 |
| | Federal | $502,000 | $36,000 | -$22,000 | $14,000 |
| Prime | Private | $34,183,000 | $5,979,000 | $737,000 | $6,716,000 |
| | State | $556,000 | $98,000 | $11,000 | $109,000 |
| | City | $2,624,000 | $464,000 | $53,000 | $516,000 |
| | County | $1,330,000 | $235,000 | $27,000 | $262,000 |
| | Other Local | $1,441,000 | $255,000 | $29,000 | $284,000 |
| | Federal | $3,143,000 | $556,000 | $63,000 | $619,000 |
| Total | | $47,233,000 | $7,868,000 | $560,000 | $8,427,000 |

For businesses with a prime engine, the capital cost is expected to be within $14,000 to $173,000. The low end of the range reflects a smaller horsepower engine (e.g.,120 hp) equipped with a diesel particulate filter (DPF). At the upper end, we used a larger engine (e.g.,1500 hp) equipped with a diesel oxidation catalyst (DOC) initially, which is later replaced with a new Tier 4 engine in 2011. The estimated annual ongoing costs are comprised of two parts: (1) a reporting cost of about $100, and (2) a cost ranging from $12 to $2,900 (depending on size and hours of use) for annual maintenance of any DPFs that are used. For example, the costs for a typical prime engine (rated at 590 hp operated 1040 hours per year) with a DPF are about $22,400 for equipment and installation, $100 for reporting, and $550 per year for ash cleaning. The costs for the same engine with a DOC that is later replaced with a Tier 4 engine are about $60,850 ($6,150 in 2005 and $54,700 in 2011), with an annual reporting cost of $100.

For businesses with emergency standby engines, we expect most operators to reduce their annual hours of operation to avoid installation of DECS, which should result in cost savings due to a reduction in the annual diesel fuel usage. For example, an operator with one engine (520 hp) could reduce maintenance and testing usage from 35 to 20 hours, thereby saving about $760 annually. While most operators will likely reduce their hours of operation to meet the ATCM requirements, we estimate that about one percent of operators will need to install a DOC.

Overall, most affected businesses will be able to absorb the costs of the proposed regulation with no significant adverse impacts on their profitability. This finding is based on the staff's analysis of the estimated change in "return on owner's equity" (ROE). The analysis found that the overall change in ROE ranges from negligible to a decline of about six percent. Generally, a decline of more than ten percent in ROE suggests a significant impact on profitability. Because the proposed ATCM would not alter significantly the profitability of most businesses, we do not expect a noticeable change in employment, business creation, elimination, or expansion, and business competitiveness in California. We also found no significant adverse economic impacts on any local or State agencies.

We estimate the overall cost effectiveness of the proposed ATCM to be about $15 per pound of diesel PM reduced, considering only the benefits of reducing diesel PM. Because the proposed ATCM will also reduce reactive organic gases (ROG) and NOx emissions, we allocated half of the costs of compliance against these benefits, resulting in cost effectiveness values of $8/lb of diesel PM and $1/lb of ROG plus NOx reduced.

With regard to mortality benefits, we estimate the cost of avoiding one premature death to be about $216,000 based on attributing half of the cost of controls to reduce diesel PM. Compared to the U.S. EPA's present assignment of $4.4 million as the value of an avoided death, this proposed ATCM is a very cost-effective mechanism for preventing premature deaths caused by diesel PM.

## B. Legal Requirements

In this section, we explain the legal requirements that must be satisfied in analyzing the economic impacts of the ATCM.

Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include a consideration of the impact of the proposed regulation on California jobs, business expansion, elimination or creation, and the ability of California business to compete with businesses in other states.

Also, State agencies are required to estimate the cost or savings to any State or local agency and school district in accordance with instructions adopted by the Department of Finance (DOF). The estimate shall include any non-discretionary cost or savings to local agencies and the cost or savings in federal funding to the State.

Moreover, Health and Safety Code section 43013(c) prohibits regulatory actions affecting nonvehicle engines (e.g., stationary diesel engines) used in agricultural operations unless the ARB determines that the standards and other requirements in the ATCM are necessary, cost-effective, and technologically feasible for such engines.

Finally, Health and Safety Code section 57005 requires the Air Resources Board to perform an economic impact analysis of submitted alternatives to a proposed regulation before adopting any major regulation. A major regulation is defined as a regulation that will have a potential cost to California business enterprises in an amount exceeding ten million dollars in any single year. Because the estimated cost of the ATCM does not exceed 10 million dollars in a single year, the proposed ATCM is not a major regulation.

The following is a description of the methodology used to estimate costs as well as ARB staff's analysis of the economic impacts on California businesses and State and local agencies.

## C. Methodology for Estimating Costs Associated with Implementation

In this section, we describe how we estimated the number and types of engines and the costs of bringing these engines into compliance with the proposed ATCM. We separately analyzed the costs on new prime engines, new emergency standby engines, existing (in-use) prime engines, and existing (in-use) emergency standby engines. The basic methodology in this section is used in subsequent sections of the report to analyze the costs to private companies and governmental agencies.

Businesses and federal, State, and local public agencies with stationary diesel-fueled engines in California will incur compliance costs as discussed below, to the extent that they have engines that must meet the performance standards in the regulation. Examples of these businesses and public agencies include hospitals, schools and universities, telecommunications providers, oil refineries, power generation facilities, banks, hotels/motels, retail stores, correctional facilities, military installations, waste and recycling facilities. The compliance costs will vary depending on the number and operating parameters of the stationary engines operated and the approach taken to comply with the proposed ATCM.

### Surveys of Engine Population

To assist in evaluating the cost impacts from the proposed ATCM, ARB staff conducted two surveys (ARB Survey) of businesses and public agencies that operate stationary engines. As described in Chapter III, the ARB Survey collected data on the number, type, application, and ownership for emergency standby and prime stationary engines operated in California. The engine population and operating characteristics reported in the ARB Survey was assumed to be representative of the total engine population subject to the ATCM. The cost analysis was performed on the population of engines reported in the ARB Survey and scaled to the total number of engines in the emissions inventory to determine the total costs of the proposed ATCM. The level of control needed to demonstrate compliance with the ATCM was based on the horsepower, age, emission rate, and hours of operation for each engine reported in the ARB Survey.

Based on the survey results, the ARB staff estimates approximately 4,280 private companies having an estimated 9,900 emergency standby engines and 1,040 prime engines will be subject to this regulation. Approximately 6.5 percent (280) of the estimated total number of businesses could be considered small businesses based on annual gross receipts of $10,000,0000 or less (per California Government Code Section 14837(d)(1)). Federal, State, and local public agencies will also be affected by the ATCM. Based on the ARB Survey, ARB staff estimates there are approximately 280 prime engines and 9,900 emergency standby engines operated by public agencies.

Capital and Recurring Costs

The cost evaluation considers both capital and on-going or recurring operating costs. Capital costs include equipment purchase, installation (i.e., piping, insulation, electrical, foundations and supports, engineering design, start-up), emissions testing and permit modification costs. The capital investment costs for purchase and installation of DECS were determined from actual costs of installing DECS on stationary diesel-fueled engines in California over the last 2-4 years (see Appendix I). A simple linear regression was used to project the costs to other engines based on their horsepower size. Based on this analysis, we estimate the cost to install a diesel particulate filter at $38 per horsepower, a diesel oxidation catalyst at $10.40 per horsepower, and a new engine at $92.65 per horsepower.

Other capital costs associated with compliance with the ATCM are emissions testing ($5,000 to $17,000 per source test), installation of hour meters ($25 per meter), and for modifications to existing permits ($1,000 when control equipment is installed and $124 when only the operating hours are adjusted). With respect to emissions testing, ARB staff believes that many engine owners will have access to data on expected engine emission rates for engines with model years 1988 and newer from the engine manufacturer. To be conservative, ARB staff assumed 50 percent of the prime engine population may need additional source testing to establish either baseline or after control PM emission rates.

Most diesel engines have an hour meter as standard equipment; however, there may be some engines that will need to install an hour meter to comply with the ATCM. If an hour meter is needed, the cost of purchase and installation of an hour meter is fairly minor. A quartz hour meter can be purchased for $25.00. The hour meter may also be useful to properly maintain the engine and thus save the owner/operator money. ARB staff assumed about 5 percent of the engines would need to install a hour meter.

Operating or recurring costs include expenditures for recordkeeping and reporting, periodic maintenance of DECS, and incremental fuel costs. We assumed annual costs of $100 per emergency standby stationary engine for owners to assemble the data and report to the district when required. ARB staff believes this is a conservative assumption since many companies already keep these records or have set schedules that allow readily-calculated annual maintenance and testing hours. In most all cases, prime stationary engines are already required by permit to maintain records on hours of operation. Therefore, we attributed no additional costs for recordkeeping for prime engines.

Maintenance costs include the removal of ash from DPFs; removal of ash is not an issue with DOCs. Based on discussions with manufacturers of DPFs, ARB staff estimated the cost for DPF maintenance (ash removal and disposal) to be about $1.33 per horsepower for every 1,500 hours of operation.

Fuel costs may be lower under the ATCM in cases where operators of emergency standby engines choose to reduce annual operation to avoid the need to install a DECS. In these cases, the proposed ATCM will likely result in cost savings. Another factor that was considered is the slightly higher fuel cost for engines with diesel particulate filters or oxidation catalysts that require the use of low sulfur diesel fuel (less than 15 ppm sulfur) prior to July 1, 2006. After July 1, 2006, this added cost should disappear, because the recently amended California diesel fuel regulations mandate the use of low sulfur fuel for all on-and off-road diesel vehicles and stationary engines, resulting in widespread availability of the fuel.

ARB staff performed the cost analysis relative to the year 2002 (current value of the control costs), and unless otherwise stated, all costs are given in 2002 dollars. Using an annual discount rate of seven percent with an inflation rate of two percent, ARB staff determined annual costs over the life of the DECS (25 years assumed for emergency backup engines, 10 years for prime engines). Where future costs are mentioned in the cost effectiveness and mortality sections, they have been adjusted to 2002 dollars using well-established economic principles.

All cost estimates are based on currently available technology as described below; staff believes it is likely that the costs will decrease as technology improves and production and sales volumes increase. Additional details on the cost analysis can be found in Appendix I.

## D. Potential Compliance Options and Related Capital and Recurring Costs

The costs associated with compliance will vary depending on whether: (1) the engine must meet the requirements for a new engine or an in-use engine and (2) if the engine is a prime engine or an emergency stand-by engine. Briefly summarized below is a discussion of the potential compliance options for typical prime and emergency standby engines, the estimated capital and recurring costs associated with each compliance, and the assumptions used in the cost analysis. Tables IX-2 and IX-3 provide a summary of the major assumptions used in these analyses.

### New Prime Engines

For new prime engines, the ATCM requires the engine to meet a PM emissions rate of 0.01g/bhp-hr. Because 0.01 g/bhp-hr engines are not expected to be available "off the shelf" until 2011, new engine purchasers would need to buy engines that are certified to 0.15 g/bhp-hr or less and install a diesel particulate filter (DPF) on the engine to lower the emissions to 0.01 g/bhp-hr. Beginning in 2011, U.S. EPA is expected to require new engines to meet the 0.01 g/bhp-hr emissions level. (see U.S. EPA's proposed rulemaking on the "*Control of Emissions of Air Pollution from Nonroad Diesel Engines and Fuel*," as published in the Federal Register (68 FR 28328, May 23, 2003)).

We assumed the capital costs attributable to the ATCM are the costs of purchase and installation of the DPF on new engines put into service prior to 2011. Additional costs include emissions testing for half the engines, incremental fuel costs associated with the purchase of low sulfur fuel in 2005, and reporting and recordkeeping as discussed below. No permit costs were assumed because a new engine would require a permit regardless of whether the ATCM were in place or not. We assumed no additional cost due to the ATCM beginning in 2011, since U.S. EPA is expected to require manufacturers to produce engines to meet the standards in the ATCM.

New Emergency Standby Engines and New Agricultural Engines

The ATCM requires new emergency standby engines and any new agricultural engine to meet PM emissions standards of 0.15 g/bhp-hr in 2005. As discussed in Appendix F, Basis for the Diesel PM Standards, there are engines in all horsepower ranges greater than 50 hp that can be purchased off the shelf at this emission limit. Therefore, we assumed there will be no capital costs attributable to the ATCM for this category of engines.

However, we did account for the costs of annual recordkeeping and reporting of hours of operation required for owners of non-agricultural emergency standby engines. For agricultural engines, the ATCM requires sellers of stationary agricultural engines to report annual sales. In the cost analysis, ARB staff assumed annual costs of $100 per distributor to assemble the data and report to the district when required. It was assumed there were 20 distributors.

In-Use Prime Engines

Certified existing prime engines (generally engines manufactured in 1996 or later) are required to either reduce diesel PM emissions by at least 85 percent or meet an emissions standard of 0.01g/bhp-hr in the 2005-2009 timeframe. In most cases, we expect that engine operators will choose to retrofit their engine with emission control technology to reduce diesel PM emissions by 85 percent. Based on the current availability of emission control technologies for diesel engines, we expect most operators to install a diesel particulate filter, for which the associated capital costs are summarized in Table IX-2.

For non-certified engines, where it is not possible to install a DPF due to technical issues, the proposed ATCM allows for installation of a DOC in 2005, followed by replacement of the engine with a new Tier 4 engine in the 2011-2013 timeframe. The capital costs in this case include the cost for the DOC and the purchase of a new engine in 2011. We assumed approximately 10% of the engines would have been at the end of their useful life in 2011 and did not attribute any new engine costs for these engines to the ATCM. Additional costs include annual maintenance costs associated with DECS.

We estimate that retrofitted DECS will last for 8400 hours of use (twice the typical warranty period required by the Verification Procedure). This is based on our assumption that prime engines run an average of 1040 hours a year, with a range of 70 to 2200 hours per year (Diesel Risk Reduction Plan, October 2000). DECS installed on these engines could last from 4 to 25 years. To be conservative, staff assigned 10 years as the average useful life of DECS installed on prime engines based on the population weighted useful life.

In-Use Emergency Standby Engines

There are a wide variety of compliance options available for in-use emergency standby engines, depending on the hours of operation needed for maintenance and testing and the emission rate of the engine. Because the ATCM proposes increasingly more stringent performance standards with increasing hours of operation for maintenance and testing, we expect that many operators will comply with the requirements by adjusting their hours for maintenance and testing to a level where additional controls are unnecessary. This compliance option will potentially result in net savings to the operator due to reduced annual fuel consumption.

ARB staff believes that the majority of owners of emergency standby engines will be able to limit the hours for maintenance and testing and avoid installing DECS. However, in some cases, an engine with a lower emissions rate will require the installation of an oxidation catalyst to allow routine maintenance and testing. In other situations, particularly for engines emitting more than 0.15 g/bhp-hr that require over 30 hours a year for maintenance and testing, the owner may need to install a diesel particulate filter or some other highly effective emission control device.

We estimate that DECS will last for 8,400 hours of use (twice the typical warranty period). Because emergency standby stationary engines run on average 30 hours a year (ARB Survey), DECS installed on these engines could last much more than 25 years. To be conservative, staff limited the DECS useful life to 25 years.

Stationary Engines $\leq$50 hp

For new stationary engines rated at or below 50 horsepower, the ATCM requires compliance with the current model Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423). Because these engines are widely available and required for use in off-road mobile or portable applications, we assumed no capital costs attributable to the ATCM.

Table IX-2 summarizes the estimated capital, operation and maintenance, reporting, and recordkeeping costs associated with the compliance options. In Table IX-3, the key cost assumptions used in the cost analysis are provided.

**Table IX-2: Estimated Capital, Operation, and Maintenance Costs for Compliance with the Proposed ATCM**

| Compliance Option | DPF | DOC | New Engine | Reduce Hours or No Additional Controls Necessary |
|---|---|---|---|---|
| **Capital Costs** | | | | |
| Equipment & Installation | $38/hp | $10.40/hp | $92.65/hp | 0 |
| Hour Meter | $25 | $25 | 0 | 0 |
| **On-Going Costs / Operation and Maintenance** | | | | |
| Cleaning | $1.33 per hp for every 1,500 hours of operation | 0 | 0 | 0 |
| Current Diesel Fuel Cost | $1.74/gal | $1.74/gal | $1.74/gal | $1.74/gal |
| Incremental Fuel Cost (2005)[1] | $0.15/gal | $0.15/gal | $0.15/gal | 0 |
| **Reporting/ Record-keeping/Compliance** | | | | |
| Reporting and Record-keeping of Hours | $100/year-engine | $100/year-engine | $100/year-engine | $100/year-engine |
| District Permits[2] Emergency | $1,000 | $1,000 | $1,000 | $124 |
| District Permits[2] Prime | $1,000 | $1,000 | $1,000 | N/A |
| Emissions Testing[3] | $5,000 -$17,000 | $5,000 - $17,000 | 0 | 0 |

1. After July 1, 2006, California diesel fuel regulations mandate the use of low sulfur fuel (15 ppm sulfur) for on and off-road motor vehicles and stationary engines. We assumed this fuel would be available for stationary use as of the same date.
2. Local district permit costs vary widely depending on the district, the size of the engine, and the permit modification. Costs ranged from less than $100 to over $2,000. We assumed an average of $1,000 per permit modification for the cost analysis. For emergency standby engines that only adjust the hours of annual operation to comply with the ATCM, we assumed a lower permit fee of $124 to reflect the expected minimal engineering analysis that would need to be conducted to change the permit conditions.
3. We estimated the costs for emission testing to range from $5,000 to $17,000. The low end represents a single mode test in triplicate and the upper end a 3-mode test done in triplicate. To be conservative, for our cost estimate we assumed the higher costs. We believe, however, that in many cases, there will be alternative data available that can be used in lieu of emission testing (e.g., manufacturers' certification data).

Table IX-3 outlines the cost assumptions used in the cost analysis for the various engine categories affected by this ATCM.

**Table IX-3: Key Cost Assumptions Used in the Cost Analysis**

| Category | Assumptions |
|---|---|
| New Prime | • New engines must install DPF between 2005-2011<br>• DPFs effective for twice the 4200 warranty hours (8400) or 25 years, which ever comes first<br>• Off-the-shelf engines available in 2011 and no capital costs attributed to the ATCM after that date<br>• 5 new prime engines/year<br>• Additional cost for low sulfur fuel in 2005 only |
| New Emergency Standby/New Agricultural Engines | • Off-the-shelf engines that meet the emissions limit available concurrent with ATCM implementation<br>• Approximately 200 new engines each year (½ ag and ½ non-ag)<br>• No capital cost attributed to the ATCM |
| In-Use Prime | • 80 percent of engines install DPF<br>• 20 percent of engines initially install a DOC and later replaced with new Tier 4 engine in 2011 – Costs assume that 10% would need a new engine anyway<br>• DPFs and DOCs effective for twice the 4200 warranty hours (8400) or 25 years, which ever comes first<br>• Expected life of the DECS averages 10 years (range from 4 to 25)<br>• Discount Rate: 7%, Inflation Rate: 2%<br>• 5% of engines of engines installing a DPF may need to install hour meters because of the ATCM requirement |
| In-Use Emergency Standby | • 90% of older engines operating over 20 hours per year will reduce hours of operation to below 20 hours per year and avoid controls<br>• Engines capped at 30 hours per year.<br>• Additional cost for low sulfur fuel in 2005 only for those engines with DPFs<br>• 5% of engines need to install hour meters because of the ATCM requirement<br>• DPFs and DOCs effective for twice the 4200 warranty hours or 25 years, which ever comes first<br>• Expected life of the DECS averages 25 years<br>• Discount Rate: 7%, Inflation Rate: 2% |
| All Engines | • Total capital costs are annualized over the lifetime of the DECS using an annual 7% discount rate and 2% inflation rate<br>• The annual costs are the sum of the annualized capital costs and the annual maintenance and operation costs.<br>• The ARB Survey data is representative of the current California stationary engine population |

## E. Estimated Costs to Businesses

Here, we estimate the costs and economic impacts on businesses. The analysis estimates the overall total statewide cost to businesses and the total costs to different sectors of the industry. We also estimate the overall impact on business competitiveness, employment, and other business impacts as required by state law.

We estimate the statewide total costs to businesses to be approximately $36.5 million dollars, which equates to annualized costs of about $6.8 million per year. The total statewide cost to businesses is derived from the combined capital and installation costs, using 2002 capital cost values, and equipment lifetime operating and maintenance costs associated with compliance with the regulation. We evaluated the costs for both in-use and new, and prime and emergency standby, stationary diesel-fueled CI engines.

Using the available information from the ARB Survey on the engine population and current in-use and expected PM emission rates, staff determined the percent of engines that would potentially incur capital costs (either from installing a DECS or purchasing a new engine) when complying with the proposed regulation. As shown in Table IX-4, for California businesses, approximately 1,200 engines may require some type of DECS emission control system to meet the performance standards proposed in the regulation.

**Table IX-4: Estimated Number of Privately Owned Stationary Diesel-Fueled CI Engines in California Potentially Requiring Installation of Diesel Emission Control Systems**

| Engine Application | | Emission Control Systems | | | |
|---|---|---|---|---|---|
| Emergency Standby | Model Year | Diesel Particulate Filter | Diesel Oxidation Catalyst | New Tier 4 Engine in 2011 | None Needed |
| | 1988 – 2002 | 0 | 0 | | 6,420 |
| | Pre 1988 | 0 | 167 | | 3,330 |
| Prime | All | 835 | 209 | 209 | 0 |

The total statewide costs to businesses were then estimated by adding the 2002 value of the capital costs and operating and maintenance costs for the life of the equipment. For both emergency and non-agricultural prime engines, the total capital cost was estimated to be $36.5 million with an annualized cost of $6.8 million. A summary of the expected costs is presented in Table IX-5.

**Table IX-5: Estimated Statewide Costs for Businesses**

| Equipment | | Total Capital Cost ($) | Annualized Capital Cost ($) | Annual Recurring Costs / Savings ($) | Total Annualized Cost ($) |
|---|---|---|---|---|---|
| In-use | Prime | $ 33,653,000 | $ 5,966,000 | $ 674,000 | $ 6,640,000 |
| | E/S | $ 2,296,000 | $ 163,000 | $ -130,000 | $ 32,800 |
| New | Prime | $ 530,000 | $ 75,000 | $ 400 | $ 75,800 |
| | E/S | 0 | 0 | $ 7,400 | $ 7,400 |
| Total | | $ 36,479,000 | $ 6,204,000 | $ 551,800 | $ 6,755,000 |

Costs to a Typical Business

Most business in California do not own any diesel-fueled stationary engines. For those businesses that do have engines, the cost will vary depending on the number of engines operated and the engine activity and operating parameters. To provide some perspective on the costs that may be incurred by a business, ARB staff estimated the costs to comply with the ATCM for a typical business with one engine. For prime engines, we used the average horsepower for prime engines reported in the emissions inventory (590 hp), and for emergency standby engines we used the average horsepower of the engines reported in the ARB Survey (700 hp). As shown in Table IX-6, most businesses that own an emergency standby diesel-fueled engine will not need to install DECS, and for those that do, the majority can use the less expensive diesel oxidation catalyst. If a business owns a prime diesel-fueled engine, then retrofit with a DPF or DOC is necessary.

**Table IX-6: Estimated Costs per Engine for a Typical Business**

| Category | Activity | % of all Private Engines | Typical Engine Size (hp) | Capital Cost per Engine | Annualized Capital Costs | Recurring Costs | Total Annual Costs ($) |
|---|---|---|---|---|---|---|---|
| Emergency Standby | Reduce Hours | 88.8% | 700 | $100 | $0 | $100 | $100 |
| | DOC | 1.5% | 700 | $7,280 | $517 | $100 | $617 |
| Prime | DPF | 7.7% | 590 | $22,420 | $2,903 | $550 | $3,453 |
| | DOC and | 1.9% | 590 | $6,136 | $1,417 | $0 | $1,417 |
| | Replace in 2011 | | | $54,664 | $3,879 | $0 | $3,879 |

The estimated capital cost to a business with a typical size emergency standby engine could range from $100 to $7,280 per engine. The low end of the cost range reflects reporting costs for businesses that will not have to install a DECS (no equipment cost). The upper end reflects businesses that will retrofit emergency standby engines with DOCs at an average capital cost of $7,280 each. The estimated capital cost to a typical business with a prime engine is $22,400 for the installation of a DPF. For those businesses with prime engines needing to install a DOC and then later replacing that engine with a new Tier IV engine in 2011, the estimated capital cost is $60,800 ($6,136 for DOC + $54,664 for new engine). For engines with a DPF, there will be an additional annual cost of approximately $550 for maintenance.

Based on the ARB Survey, for those businesses that do have either emergency standby or prime stationary diesel-fueled engines, the average business owns 2.5 emergency standby engines of 700 horsepower, and three prime engines of 590 horsepower.[16] The typical small business that owns an emergency standby engine has 1.5 emergency standby engines. The typical small business owning prime engines has 1.75 prime engines. The costs for typical businesses and typical small businesses can be estimated by multiplying the cost per engine values, present in Table IX-6 above, by the typical number of engine per business. Additional information on the impacts to businesses can be found in Appendix I.

Costs and Impacts to Various Industry Sectors

ARB staff categorized the emergency standby stationary diesel-fueled engines owned by businesses and reported in the ARB Survey into nine categories. These categories are hospitals, power generation, telecommunications, broadcasting, hotels, petroleum refiners, food processing, and private other. The category 'private other' is made up of a wide variety of businesses or agencies that do not fit within the other categories. Some examples of 'private other' engines include malls, mail-order retailers, retirement homes, condominiums, corporate headquarters, parcel delivery hubs, freight, research facilities, ports, airports, manfacturing, mining, financial, mills, pharmaceutical companies, ski resorts, aquariums, and museums. Because prime engines were reported by a very diverse range of businesees, we did not try to subcategorize these engines.

The methodology used to estimate the costs in Table IX-7 is the same as that used to estimate the total statewide costs of the ATCM in Section D, except that the individual industry sectors were analyzed separately. The industry sectors are derived from the businesses responding to our survey. Based on the information in the ARB survey and applying the assumptions outlined in Table IX-3, there were actual cost savings to the telecommunication industry due to the reduction in the annual hours of operation for maintenance and testing of emergency standby engines.

[16] We believe this may be an overestimate of the number of engines owned by a typical business. Some of the telecommunication businesses own hundreds of engines, which may have biased the average.

### Table IX-7: Distribution of Total Costs by Businesses Category

| Business Category | Estimated Total Capital Costs | Annualized Capital Cost | Annual Recurring Costs ($) | Total Annualized Cost ($) |
|---|---|---|---|---|
| ***Emergency Standby Applications*** | | | | |
| Hospitals | $ 200,916 | $ 14,255 | $ 4,628 | $ 18,884 |
| Power Generation | $ 74,810 | $ 5,942 | $ - 2,769 | $ 4,957 |
| Telecommunications | $ 155,710 | $ 11,555 | $ - 12,418 | $ 2,607 |
| Broadcasting | $ 95,850 | $ 7,296 | $ - 4,625 | $ 2,671 |
| Hotels | $ 101,830 | $ 8,239 | $ - 50 | $ 10,662 |
| Petroleum Refiners | $ 97,160 | $ 7,845 | $ - 3,025 | $ 4,820 |
| Food Processing | $ 62,200 | $ 5,174 | $ - 1,570 | $ 3,604 |
| Other[2] | $ 741,850 | $ 57,138 | $ - 44,970 | $ 12,168 |
| ***Prime Applications*** | | | | |
| Prime [3] | $ 36,797,505 | $ 6,040,991 | $ 674,483 | $ 6,715,474 |
| ***Total*** | $ 38,327,831 | $ 6,158,436 | $ 609,684 | $ 6,775,846 |

1. We are assuming that all hospitals and health care facilities will reduce maintenance and testing to less than 20 hours a year pending legislative approval of AB 390. The 458,887 is the estimated reporting and recordkeeping costs for a 25 year period.
2. Examples " other" business types using emergency standby engines include but are not limited to the following: retail, office buildings/property management, airports, ski resorts, and factories.
3. The use of prime engines was not easily categorized by business type. A wide variety of business types use prime engines including: private waste and sanitation facilities, power generation, food processing, petroleum refiners, construction, sand and gravel facilities, shipyard, mountain resorts, recycling, landfill, and composting facilities.

Potential Business Impacts

In this section, we analyze the potential impacts of the estimated costs of the proposed ATCM on business enterprises in. Section 11346.3 of the Government Code requires that, in proposing to adopt or amend any administrative regulation, state agencies shall assess the potential for adverse economic impact on California business enterprises and individuals. The assessment shall include a consideration of the impact of the proposed or amended regulation on the ability of California businesses to compete with businesses in other states, the impact on California jobs, and the impact on California business expansion, elimination, or creation.

This analysis is based on a comparison of the annual return on owner's equity (ROE) for affected businesses before and after the inclusion of the equipment costs, associated recurring costs, and fees. The analysis also uses publicly available information to assess the impacts on competitiveness, jobs, and business expansion, elimination, or creation.

ARB staff does not have access to financial records for most of the privately-owned companies that responded to the ARB Survey. However, the small business status of the survey respondents was determined by including a query on the ARB Survey for the respondent to indicate if their business was a small business (annual gross receipts of $10,000,000 or less per Government Code section 14837 (d)(1)). Based on the ARB Survey responses, staff identified approximately 6.5 percent of the businesses (~280 statewide) as small businesses. These small businesses account for 3.7 percent of the emergency standby engines owned by California businesses (~354 engines statewide). The ARB Survey responses also indicate 38 percent of the businesses that own prime engines are would qualify as small businesses, representing 26 percent of the prime engines.

The types of businesses that may be impacted include private schools and universities, private water treatment facilities, hospitals, office buildings, power generation, communications, broadcasting, building owners, banks, hotel/motels, refiners, resorts, recycling centers, quarries, wineries, dairies, food producing and packaging, manufacturing, landfills, and retail stores. Based on the ARB Survey, staff estimates approximately 4,280 companies, having an estimated 9,900 emergency standby stationary engines and 1,040 prime engines, will be affected by this regulation. The vast majority of the engines requiring a retrofit or replacement are prime engines. The affected businesses fall into different industry classifications, as shown in Table IX-8.

**Table IX-8: List of Industries with Affected Businesses**

| SIC Code | Industry |
|---|---|
| 0723 | Agricultural Services |
| 1311 | Crude Petroleum And Natural Gas |
| 1389 | Oil and Gas Field Services |
| 1429 | Crushed and Broken Stone |
| 1442 | Construction Sand And Gravel |
| 1542 | General Contractors-Nonresidential Buildings, Other Than Industrial |
| 2048 | Prepared Feeds and Feed Ingredients for Animals and Fowls |
| 2421 | Sawmills and Planing Mills, General |
| 2951 | Asphalt Paving Mixtures and Blocks |
| 3272 | Concrete Products, Except Block and Brick |
| 3273 | Ready-Mixed Concrete |
| 3479 | Coating, Engraving, and Allied Services |
| 3711 | Motor Vehicles and Passenger Car Bodies |
| 3731 | Ship Building and Repairing |
| 4491 | Marine Cargo Handling |
| 4581 | Airports, Flying Fields, and Airport Terminal Services |
| 4911 | Electric Services |
| 4931 | Electric & Other Services Comb |
| 4953 | Refuse Systems |
| 5093 | Scrap and Waste Materials |
| 5932 | Used Merchandise Stores |
| 6531 | Real Estate Agents and Managers |
| 7353 | Heavy Construction Equipment Rental and Leasing |
| 7699 | Repair Shops and Related Services, Not Elsewhere Classified |

The approach used in evaluating the potential economic impact of the proposed ATCM on California businesses is as follows:

(1) All affected businesses are identified from responses to the ARB surveys. Standard Industrial Classification (SIC) codes identified by these businesses are listed in Table IX-8 above.

(2) Annual costs for the ATCM are estimated for each of these businesses based on the assumptions previously discussed.

(3) The total annual cost for each business is adjusted for both federal and states taxes.

(4) These adjusted costs are subtracted from net profit data and the results used to calculate the Return on Owners' Equity (ROE). The resulting ROE is then compared with the ROE before the subtraction of the adjusted costs to determine the impact on

the profitability of the businesses. A reduction of more than 10 percent in profitability is considered to indicate a potential for significant adverse economic impacts. This threshold is consistent with the thresholds used by the U.S. EPA and others.

Using Dun and Bradstreet financial data from 1999 to 2001, staff calculated the ROEs, both before and after the subtraction of the adjusted annual costs, for the typical businesses from each industry category. These calculations were based on the following assumptions.

- All affected businesses are subject to federal and state tax rates of 35 percent and 9.3 percent, respectively.

- Affected businesses neither increases the prices of their products nor lowers their costs of doing business through cost-cutting measures because of the ATCM.

These assumptions, though reasonable, might not be applicable to all affected businesses.

California businesses are affected by the proposed annual cost of the ATCM to the extent that the implementation of the proposed ATCM reduces their profitability. Using ROE to measure profitability, we found that the ROE range for typical businesses from all industry categories would have declined by about 0.01 to 6 percent in 2006. This represents a small decline in the average profitability of the affected businesses. Overall, most affected businesses will be able to absorb the costs of the proposed ATCM with no significant impacts on their profitability.

Potential Impact on Business Competitiveness

The proposed ATCM may affect the ability of some California businesses that sell their products nationally to compete with businesses outside the State due to the slight increase in stationary diesel-fueled engine costs. However, most businesses affected by this proposed regulation compete in local markets and are not subject to competition from businesses located outside the State.

Emergency standby diesel-fueled engines are located in a wide variety of businesses. However, ARB staff estimates that only one percent of the emergency engines will require modifications that will result in costs to the engine owners. For owners of prime engines, we expect approximately 80 percent to install a DPF and 20 percent to install a DOC with the intent to replace with a new engine in 2011. Most of the affected businesses are large and are expected to be able to absorb the increased costs associated with the proposed ATCM with no significant impact on their ability to compete with non-California businesses (see analysis in Appendix I).

Potential Impact on Employment, Business Creation, Elimination or Expansion

The proposed ATCM is expected to have no noticeable impacts on employment and business' status. Businesses that manufacture, sell, install, repair, or clean diesel particulate emission control systems may experience an increase in demand for their products or services, resulting in an expansion of those businesses or the creation of new businesses. Staff believes used engine dealers would not be eliminated; instead, we believe the dealers would adapt to incorporate additional refurbishment and upgrading of the engines for resale.

ARB staff believes jobs will not be eliminated as a result of the ATCM, but it may lead to the augmentation or alteration of job duties, leading to no net result change in the number of jobs. For example, a mechanic who previously worked on muffler installation would now be installing a DECS. Staff believes additional training and emissions testing may be required for these additional duties, if not provided by the DECS manufacturers. To the extent that DECS are manufactured in California, some jobs may also be created. Some jobs will be created to install, repair, or clean DECS.

## F. Potential Costs to Local, State, and Federal Agencies

In this section, we estimate the total costs to governmental agencies. The analysis also estimates the total costs to local, state, and federal agencies individually. As shown in Table IX-9, ARB staff estimates the total costs to public agencies to be approximately 8.1 million dollars, with annualized costs of approximately $1.7 million.

**Table IX-9: Summary of Total Lifetime and Annualized Costs for Public Agency Compliance with the ATCM**

| Engine Application | Category | Total Capital Cost ($) | Annualized Capital Cost ($) | Annual Recurring Costs ($) | Total Annualized Cost ($) |
|---|---|---|---|---|---|
| Emergency Standby | State | $198,870 | $14,110 | -$110,820 | -$96,710 |
| | City | $370,000 | $26,235 | -$12,625 | $13,610 |
| | County | $191,850 | $13,610 | -$20,450 | -$6,840 |
| | Other Local | $396,590 | $28,142 | -$71,302 | -$43,160 |
| | Federal | $502,060 | $35,624 | -$22,084 | $13,540 |
| Prime | State | $555,892 | $98,266 | $11,135 | $109,400 |
| | City | $2,624,238 | $463,897 | $52,563 | $516,460 |
| | County | $1,330,292 | $235,164 | $26,646 | $261,810 |
| | Other Local | $1,441,043 | $254,736 | $28,864 | $283,600 |
| | Federal | $3,142,928 | $555,587 | $62,953 | $618,540 |
| Total | | $10,753,762 | $1,725,371 | -$55,121 | $1,670,250 |

Local Public Agencies

The majority of local governments provide services requiring the use of emergency engines to insure public safety or maintain essential services during emergencies. Examples include police departments, jails, fire departments, government data storage facilities, and sewage and water treatment facilities. In the event of power outages, floods or other emergencies, the emergency standby engines prevent disruptions in critical operations.

Based on the ARB Survey and the most current stationary engine emissions inventory, we estimate there are approximately 5,400 emergency standby engines and 170 prime engines owned and operated by local government agencies. As shown in Table IX-10, approximately 45 diesel backup engines and 167 diesel prime engines will incur capital costs associated with installation of a DECS. The remaining engines will incur minimal costs for reporting and record-keeping requirements proposed in the regulation.

**Table IX-10: Estimated Number of Local Publicly Owned Stationary Diesel-Fueled CI Engines in California Potentially Requiring Installation of Diesel Emission Control Systems**

| Engine Application | | | Emission Control Systems | | | |
|---|---|---|---|---|---|---|
| | Category | Total Engine Population | Diesel Particulate Filter | Diesel Oxidation Catalyst | New Tier 4 Engine | None Needed |
| Emergency Standby | City | 2,465 | | 12 | | 2,453 |
| | County | 923 | | 8 | | 915 |
| | Other Local | 2,044 | | 25 | | 2,019 |
| | Total Local Standby | 5,432 | | 45 | | 5,387 |
| Prime | City | 81 | 65 | 16 | 16 | |
| | County | 41 | 33 | 8 | 8 | |
| | Other Local | 45 | 36 | 9 | 9 | |
| | Total Local Prime | 167 | 134 | 33 | 33 | |

To estimate the expected costs of the proposed ATCM to local public agencies, we used the cost estimates and assumptions outlined in Tables IX-2 and IX-3 and the basic cost methodology discussed previously. Using these assumptions, the estimated average cost to retrofit or modify a emergency standby stationary diesel-fueled engine is about \$5,600 for a city owned engine (average 450 hp) and \$8,100 for a county owned engine (average 680 hp). The estimated total equipment and installation costs on local governments to modify prime and emergency standby stationary diesel-fueled engines will be approximately \$6,354,000. The estimated discounted capital cost plus the annual additional operation and maintenance cost on local governments is approximately \$1,021,000 annually. A brief summary of the estimated costs for local public agencies is presented in Table IX-11.

**Table IX-11: Estimated Statewide Costs for Local Publicly Owned Stationary Diesel-Fueled CI Engines in California**

| Engine Application | Category | Total Capital Cost ($) | Annualized Capital Cost ($) | Annual Recurring Costs ($) | Total Annual Cost ($) |
|---|---|---|---|---|---|
| Emergency Standby | City | $370,000 | $26,200 | -$12,630 | $13,600 |
| | County | $191,900 | $13,600 | -$20,450 | -$6,800 |
| | Other | $396,600 | $28,100 | -$71,300 | -$43,200 |
| Prime | City | $2,624,200 | $463,900 | $52,600 | $516,500 |
| | County | $1,330,300 | $235,200 | $26,600 | $261,800 |
| | Other | $1,441,000 | $254,700 | $28,900 | $283,600 |
| Total | | $6,354,000 | $1,021,000 | $3,700 | $1,025,500 |

To estimate the fiscal impacts for fiscal year (FY) 2005-2006, we assumed that 25 percent of the total engines needing a retrofit would incur costs for that current year. As currently proposed, the regulation requires 1989 model year and pre-1989 model year engines to be in compliance by January 1, 2006; 1990 model year to 1995 model year engines to be in compliance by January 1, 2007; and 1996 and newer model year engines to be in compliance by January 1, 2008. In addition, owners of four or more engines have until January 1, 2009, to have all the engines in compliance with the performance standards specified in the regulation. Because we lacked detailed information on the age distribution of engines owned by local public agencies, we concluded a 25 percent compliance rate per year was reasonable. Using this assumption, we estimate the total cost for the 2005-2006 fiscal year is about 25 percent of the total annual cost, or $256,380.

There may also be other potential cost impacts. For example, for public agencies that contract with private companies, an increase in the contract cost may occur under the terms of the contract or at the renewal of the contract. Staff did not consider this a direct cost, and, therefore, did not include it in the cost to local government agencies.

The local air districts are responsible for enforcing this regulation. The enforcement of the engines affected by this regulation would probably take the form of a typical inspection. The typical inspection takes about one hour annually for a prime engine and about a half-hour every four years for an emergency engine. Based on the number of engines in the ARB Survey, the additional local costs on the air districts statewide will be approximately $362,000 per year for district enforcement.

Fiscal Effect on State Government

Several State agencies provide services requiring emergency backup diesel equipment for public safety. Examples of these operations include prisons, government data storage facilities, emergency flood control, and college campuses. Some agencies may also have prime engines such as wood chippers used for composting forest waste. Examples of the State agencies that potentially may be impacted by the ATCM include the Department of Corrections, General Services, the University of California and the California State University systems, the Department of Water Resources, the Franchise Tax Board, and the Department of Fish and Game. Based on the ARB Survey, and as shown in Table IX-12, we estimate about 882 standby and 17 prime diesel engines operated by State agencies will be impacted by this regulation.

**Table IX-12: Percentage of State Owned Stationary Diesel-Fueled CI Engines in California Potentially Requiring Installation of Diesel Emission Control Systems**

| Engine Application | | | Emission Control Systems | | | |
|---|---|---|---|---|---|---|
| Category | | Total Engine Population | Diesel Particulate Filter | Diesel Oxidation Catalyst | New Tier 4 Engine | None Needed |
| **Emergency Standby** | State | 882 | | 9 | | 873 |
| **Prime** | State | 17 | 14 | 3 | 3 | |

To estimate the expected costs associated with State agencies compliance with the regulation, we used the cost estimates and assumptions outlined in Tables IX-2 and IX-3 and the basic cost methodology discussed previously. As shown in Table IX-13, the proposed ATCM is expected to result in $754,500 initial capital cost to the State agencies. The fuel savings and retrofit costs of emergency standby engines are calculated over 25 years and the retrofit costs for prime engines are calculated over 10 years. The result is a low annual cost of $12,690.

A *brief summary of the estimated costs for State agencies is presented in* Table IX-13. Similar to the cost estimate for local public agencies, the expected costs for the FY 2005-2006 were estimated by assuming 25 percent of the engines would need to comply with the regulation in that year at a cost for equipment and installation of $189,000.

**Table IX-13: Estimated Statewide Costs for State Owned Stationary Diesel-Fueled CI Engines in California**

| Engine Application | Total Capital Cost ($) | Annualized Capital Costs ($) | Annual Recurring Cost ($) | Total Annual Cost ($) |
|---|---|---|---|---|
| Emergency Standby | $198,900 | $14,100 | -$110,820 | -$96,710 |
| Prime | $555,900 | $98,300 | $11,140 | $109,400 |
| Total | $754,800 | $112,400 | -$99,680 | $12,690 |

Fiscal Impact on Federal Agencies

Several federal agencies provide services requiring emergency backup diesel equipment for public safety. Examples of operations requiring emergency standby engines are prisons, government data storage facilities, and military bases. Examples of the federal agencies that potentially may be impacted by the ATCM include, the National Aeronautics and Space Administration (NASA), military bases, U.S. Park Service facilities, Federal Bureau of Prisons, and the Federal Aviation Administration. As shown in Table IX-14, we estimate approximately 3,594 emergency standby and 98 prime diesel engines operated by the federal government will be impacted by this regulation.

**Table IX-14: Percentage of Federally Owned Stationary Diesel-Fueled CI Engines in California Potentially Requiring Installation of Diesel Emission Control Systems**

| Engine Application | | | Emission Control Systems | | | | | |
|---|---|---|---|---|---|---|---|---|
| Category | | Total Engine Population | Diesel Particulate Filter | Diesel Oxidation Catalyst | New Engine + DPF | New Tier 4 Engine | None Needed |
| Emergency Standby | Federal | 3,594 | | 12 | | | 3,582 |
| Prime | Federal | 98 | 78 | 20 | | 20 | |

**Source: ARB Survey**

To estimate the expected costs associated with federal agencies compliance with the regulation, we used the cost estimates and assumptions outlined in Tables IX-2 and IX-3 and the basic cost methodology discussed previously. As shown in Table IX-15, the estimated total capital costs of Federal agencies to comply with the regulation is $3,645,000, with annualized capital costs plus the annual operation and maintenance costs of about $632,000. The fuel savings and retrofit costs of emergency standby engines are calculated over 25 years, and the retrofit costs for prime engines are calculated over 10 years. Similar to the cost estimate for local public agencies, the expected costs for the FY 2005-2006 were estimated by assuming 25 percent of the engines would need to comply with the regulation in that year at a cost for equipment and installation of $911,250.

**Table IX-15: Estimated Statewide Costs for Federally Owned Stationary Diesel-Fueled CI Engines in California**

| Engine Application | Total Capital Cost ($) | Annualized Capital Cost ($) | Annual Recurring Cost ($) | Total Annualized Cost ($) |
|---|---|---|---|---|
| Emergency Standby | $502,100 | $35,600 | -$22,100 | $13,500 |
| Prime | $3,142,900 | 555,600 | $63,000 | $618,500 |
| **Total** | $3,645,000 | $591,200 | $40,900 | $632,100 |

## G. Summary of Total and Annual Costs for Compliance with the Proposed ATCM

In this section, the results shown in Tables IX-5 and IX-9 are summarized in Table IX-16 (i.e., the total cost of the ATCM to both private companies and governmental agencies). Based on these results, we estimate the total statewide capital costs for all affected entities in the State are $47 million, with an annualized cost of $8.4 million.

**Table IX-16: Summary of Total Lifetime and Annualized Costs for Compliance with the Proposed ATCM**

| Engine Application | Category | Total Capital Cost | Annualized Capital Cost | Annual Recurring Costs ($) | Total Annualized Cost ($) |
|---|---|---|---|---|---|
| **Emergency Standby** | Private | $2,296,000 | $163,000 | -$123,000 | $40,000 |
| | State | $199,000 | $14,000 | -$111,000 | -$97,000 |
| | City | $370,000 | $26,000 | -$13,000 | $14,000 |
| | County | $192,000 | $14,000 | -$20,000 | -$7,000 |
| | Other Local | $397,000 | $28,000 | -$71,000 | -$43,000 |
| | Federal | $502,000 | $36,000 | -$22,000 | $14,000 |
| **Prime** | Private | $34,183,000 | $5,979,000 | $737,000 | $6,716,000 |
| | State | $556,000 | $98,000 | $11,000 | $109,000 |
| | City | $2,624,000 | $464,000 | $53,000 | $516,000 |
| | County | $1,330,000 | $235,000 | $27,000 | $262,000 |
| | Other Local | $1,441,000 | $255,000 | $29,000 | $284,000 |
| | Federal | $3,143,000 | $556,000 | $63,000 | $619,000 |
| **Total** | | $47,233,000 | $7,868,000 | $560,000 | $8,427,000 |

## H. Cost Effectiveness

In this section, the cost-effectiveness of the ATCM is estimated. Cost effectiveness is expressed in terms of control costs (dollars) per unit of air emissions reduced (pounds). As described below, for example, the cost effectiveness for the proposed ATCM is determined by dividing the annualized capital costs plus the annual operation and maintenance costs by the annual pounds of diesel PM reduced. For the mortality cost-effectiveness, we presented the annualized capital costs and annual operation and maintenance costs in 2002 equivalent expenditure dollars.

The annualized capital costs and annual operation and maintenance have been represented differently for the cost effectiveness and mortality sections. ARB does not have data to determine multiple engine ownership and associated engine ages to accurately determine the retrofit phase in schedule. Therefore, the capital costs at the beginning of the ATCM implementation are phased in over four years to accommodate potential issues regarding the engine age and multiple engine ownership. Also, all costs are brought back to 2002 net present value to compare with other regulations. This method better represents when emission reductions will occur and more accurately represents costs further in the future.

### Expected Emission Reductions

We estimated the projected annual emission reductions under the ATCM as described in Appendix D. The following provides a summary of the annual statewide reductions that will result from the proposed ATCM.

The baseline and ATCM-controlled diesel PM emissions are calculated based on the statewide inventory. These results are shown in Table IX-17.

Table IX-17: Estimated Statewide Diesel PM Annual Emissions and Reductions

| Year | Uncontrolled Emissions (tons/day) | Controlled Emissions* (tons/day) | Reduction Emissions* (tons/day) | Reduction Emissions (tons/yr) |
|---|---|---|---|---|
| 2005 | 0.8680 | 0.4067 | 0.4613 | 168.4 |
| 2006 | 0.8134 | 0.3957 | 0.4177 | 152.5 |
| 2007 | 0.7786 | 0.3816 | 0.3970 | 144.9 |
| 2008 | 0.7414 | 0.3619 | 0.3795 | 138.5 |
| 2009 | 0.7054 | 0.3450 | 0.3604 | 131.5 |
| 2010 | 0.6452 | 0.3482 | 0.2970 | 108.4 |
| 2011 | 0.6334 | 0.3112 | 0.3222 | 117.6 |
| 2012 | 0.5974 | 0.2943 | 0.3031 | 110.6 |
| 2013 | 0.5614 | 0.2774 | 0.2840 | 103.7 |
| 2014 | 0.5254 | 0.2605 | 0.2649 | 96.7 |
| 2015 | 0.4791 | 0.2137 | 0.2654 | 96.9 |
| 2016 | 0.4534 | 0.2267 | 0.2267 | 82.7 |
| 2017 | 0.4174 | 0.2098 | 0.2076 | 75.8 |
| 2018 | 0.3814 | 0.1929 | 0.1885 | 68.8 |
| 2019 | 0.3454 | 0.1760 | 0.1694 | 61.8 |
| 2020 | 0.3246 | 0.1720 | 0.1526 | 55.7 |

*Expected emissions and emission reductions due to implementation of ATCM

Cost Effectiveness

To determine the cost-effectiveness of the proposed regulation, we divided the annualized costs and annual ongoing costs by the diesel PM emission reductions attributable to the ATCM. The resulting cost effectiveness in each year of implementation up to 2020 is listed in Table IX-18. The estimated overall annual cost effectiveness, weighted by annual PM reduced, is $15.4 per pound of diesel PM reduced, if all the costs of compliance are allocated to diesel PM reduction. The range if from $4 to $26 per pound of diesel PM reduction. This cost effectiveness is near the lower end of anticipated cost effectiveness for diesel PM controls.

**Table IX-18: Summary of Annual Cost Effectiveness for the Proposed ATCM**

| Year | Sum Annual Costs ($) | Inventory Based PM Reduced | Cost Effectiveness | |
|---|---|---|---|---|
| | | (tons/yr) | ($/ton) | ($/lb) |
| 2005 | $ 1,354,316 | 145 | $ 8,043 | $ 4.02 |
| 2006 | $ 3,108,844 | 125 | $ 20,391 | $ 10.20 |
| 2007 | $ 4,693,204 | 114 | $ 32,388 | $ 16.19 |
| 2008 | $ 6,119,622 | 103 | $ 44,179 | $ 22.09 |
| 2009 | $ 5,842,752 | 93 | $ 44,416 | $ 22.21 |
| 2010 | $ 5,578,374 | 73 | $ 51,459 | $ 25.73 |
| 2011 | $ 5,409,320 | 76 | $ 45,996 | $ 23.00 |
| 2012 | $ 5,159,407 | 68 | $ 46,636 | $ 23.32 |
| 2013 | $ 4,135,495 | 61 | $ 39,895 | $ 19.95 |
| 2014 | $ 3,197,399 | 54 | $ 33,069 | $ 16.53 |
| 2015 | $ 2,358,752 | 51 | $ 24,349 | $ 12.17 |
| 2016 | $ 1,592,726 | 42 | $ 19,248 | $ 9.62 |
| 2017 | $ 1,336,349 | 36 | $ 17,636 | $ 8.82 |
| 2018 | $ 1,100,777 | 32 | $ 15,999 | $ 8.00 |
| 2019 | $ 900,639 | 27 | $ 14,566 | $ 7.28 |
| 2020 | $ 717,067 | 23 | $ 12,874 | $ 6.44 |
| **Weighted Average =** | | | $ 30,821 | $ 15.41 |

Since the ATCM will also result in reductions in reactive organic gases (ROG) and oxides of nitrogen (NOx) emissions, staff conducted a second cost effectiveness analysis in which half of the cost of compliance was allocated to PM benefits and half the cost was allocated to ROG plus NOx benefits. This results in cost effectiveness values of $7.70/lb diesel PM, weighted by annual PM reduced, and $0.92/lb of ROG plus NOx, weighted by annual ROG plus NOx reduced. The resulting ROG plus NOx cost effectiveness for the combined standby and prime engines in the State are listed in Table IX-19. Based on their relative weights, the ROG and NOx cost effectiveness can be further expressed as $0.17 per pound ROG and $0.75 per pound NOx based on the respective weights. This cost effectiveness is near the lower end of anticipated cost effectiveness for diesel PM controls.

**Table IX-19: Summary of Annual ROG Plus NOx Cost Effectiveness for the Proposed ATCM**

| Year | Sum of Annual[1] Costs ($) | Inventory Reduced | | | ROG+NOx Cost Effectiveness | |
|---|---|---|---|---|---|---|
| | | ROG (tons/yr) | NOx (tons/yr) | ROG + NOx (tons/yr) | ($/ton) | ($/lb) |
| 2005 | $ 677,158 | 165 | 418 | 583 | $ 1,162 | $ 0.58 |
| 2006 | $ 1,554,422 | 157 | 306 | 463 | $ 3,358 | $ 1.68 |
| 2007 | $ 2,346,602 | 149 | 389 | 538 | $ 4,360 | $ 2.18 |
| 2008 | $ 3,059,811 | 141 | 455 | 596 | $ 5,131 | $ 2.57 |
| 2009 | $ 2,921,376 | 133 | 530 | 663 | $ 4,407 | $ 2.20 |
| 2010 | $ 2,789,187 | 126 | 352 | 478 | $ 5,839 | $ 2.92 |
| 2011 | $ 2,704,660 | 118 | 679 | 796 | $ 3,396 | $ 1.70 |
| 2012 | $ 2,579,704 | 110 | 753 | 863 | $ 2,989 | $ 1.49 |
| 2013 | $ 2,067,748 | 102 | 828 | 930 | $ 2,224 | $ 1.11 |
| 2014 | $ 1,598,699 | 94 | 902 | 997 | $ 1,604 | $ 0.80 |
| 2015 | $ 1,179,376 | 87 | 897 | 983 | $ 1,199 | $ 0.60 |
| 2016 | $ 796,363 | 79 | 1,051 | 1,130 | $ 705 | $ 0.35 |
| 2017 | $ 668,174 | 71 | 1,126 | 1,197 | $ 558 | $ 0.28 |
| 2018 | $ 550,388 | 63 | 1,200 | 1,263 | $ 436 | $ 0.22 |
| 2019 | $ 450,320 | 55 | 1,275 | 1,330 | $ 339 | $ 0.17 |
| 2020 | $ 358,533 | 48 | 1,485 | 1,532 | $ 234 | $ 0.12 |
| | | | | Weighted Average = | $ 1,834 | $ 0.92 |

[1] Annual costs is the sum of annualized capital costs and annual ongoing costs
Source: ARB Emissions Inventory, Off-Road Model

*Cost-Effectiveness of the ATCM as Applied to Agricultural Operations*

For several reasons, the ARB staff believes the ATCM is cost-effective for agricultural operations. First, the ATCM applies only to new diesel engines used in agricultural operations. Therefore, agricultural operations will not need to buy new compliant engines until they need such new engines. In that case, the agricultural operations would have replaced their existing engines with new engines irrespective of the ATCM. Second, the ATCM requires these new engines to meet a 0.15 g/bhp-hr diesel PM limit and the current off-road certification standards. As noted earlier in this chapter, such engines are readily available "off-the-shelf" and have been shown to be cost-effective. Third, the ATCM does not require retrofits on existing, in-use engines. Therefore, when agricultural operations decide to purchase new engines, they would be required to buy new engines that are already available "off-the-shelf" and cost-effective, which they would have done anyway irrespective of the ATCM. This is the basis for our finding that the cost attributable to the ATCM for agricultural operations is essentially zero for purchasing a new engine. And for these reasons, the ARB staff believes the ATCM is cost-effective for agricultural operations.

## X. ADDITIONAL CONSIDERATIONS

In this chapter ARB staff provide additional supporting documentation for the proposed ATCM and discussion on issues raised during the development of the ATCM.

### A. Direct-Drive Diesel Fire Pump Engines

The proposed ATCM establishes emission standards for emergency standby engines based on the hours of operation needed for maintenance and testing. The greater the number of hours operated for maintenance and testing, the more stringent the emission performance standard. During the development of the ATCM, concerns were raised regarding the application of the performance standard to emergency standby fire pump engines. Specifically, most fire pump engines are tested according to the National Fire Protection Association's (NFPA) "Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems" (NFPA 25), which requires approximately 26 hours of testing in a one year period with an additional two to four hours needed once every five years. Because these pump engines are used for fire protection, concerns were raised regarding the ability of the pump engines to perform with a diesel emission control strategy installed and whether the pump engines with emission controls would still be certified by the Underwriters Laboratory (UL) or FM Global (FM). The following explains fire pump engines, fire pump engine regulations and the requirements included in the ATCM that were proposed to address these concerns.

Fire Pump Engine Power Configurations

Fire pumps are used to supply water to building fire sprinkler systems. Fire pumps are needed at sites where water pressure is insufficient for fire protection. (Gray, 2001) There are thee main types of fire pump power configurations:

- Electric motor-driven fire pumps (electric pumps) are the most common method of powering fire pumps. Electric fire pumps are reliable power sources and offer no emissions.
- Electric motor-driven fire pumps with diesel generator backup engines are also commonly used. In this configuration, in the event of power interruption, the generator would provide electrical power to the fire pump.
- Direct-drive diesel engine fire pumps (direct-drive pumps) are fire pumps directly powered by a diesel-fueled engine. Generally, direct drive diesel engine fire pumps are used to power fire pumps in areas with unreliable electrical power and in remote areas. (Sweat, 2003)

Direct-drive pump engines are designed slightly different than other diesel-power sources; reliability and running until failure are priorities. According to a representative from Cummins Engine Company, Inc., there are two main differences in the engines. First, the cooling system is designed like that of a marine engine. The radiator is removed and water flow enters the engines from the water supply, exiting the engine flowing to the fire pump. This ensures that a constant supply of cool water flows into the engine. Second, the electronic protection system is turned off. On non-direct-drive pumps, this system would normally protect the engine by preventing operation outside of normal specifications. By contrast, the system is turned off for direct-drive pumps so that the pumps operate to failure despite warnings for high water temperature, low oil pressure, or other condition outside of normal specifications. (Cummins, 2003a) (Cummins, 2003b)

Fire Pump Engine Maintenance and Testing Requirements

There are requirements in State law that specifies how fire pump engines should be maintained and tested. As discussed below, these requirements refer back to NFPA guidelines.

California regulations have requirements for the testing and maintenance of fire pump engines that are linked to NFPA guidelines. The current 2001 California Building Code, Chapter 35 "Uniform Building Code (UBC) Standard," page 1-308 refers to NFPA 13 "Standard for the Installation of Sprinkler Systems" which in turn refers to NFPA 25. Currently, the Office of the State Fire Marshal (SFM) office is adopting NFPA 25 in the update of title 19 of the California Code of Regulations as the standard for the inspection, testing, and maintenance of water-based fire protection systems. When NFPA 25 is incorporated into title 19, it will become an explicit standard in the California Building Code. (SFM, 2003)

There are two main NFPA standards concerning diesel fire pump engines and pumps. The first is NFPA 20 "Standard for the Installation of Stationary Pumps for Fire Protection." The second is NFPA 25 "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems." These two volumes cover what is needed to install, operate and maintain diesel fire pump engines/pumps. In addition, a separate standard, NFPA 110 "Standard for Emergency and Standby Power Systems," recommends guidelines for the maintenance and testing of emergency standby generators that are used for providing backup power to electrical systems, including electrically driven fire pumps. A summary of the suggested annual hours necessary for the recommended maintenance and testing requirements for these NFPA standards is provided in Table X-1. (NFPA, 1998) (NFPA, 2003)

**Table X-1: Existing NFPA Maintenance and Testing Guidelines**

| | **Fire Pump Power Configuration** | | |
|---|---|---|---|
| | **Direct Drive** | **Electric** | **Electric with Generator Backup** |
| **Suggested Maintenance and Testing Hours Per Year** | 29-34 hours (30 minutes each week plus additional annual testing) | 9 hours (10 minutes each week) | 6 hours (30 minutes each month) |
| **Reference Guidelines** | NFPA 25<br>2001 UBC Chapter 35 | NFPA 25 | NFPA 110 |

Fire Pump Engine Inventory

Because concerns regarding fire pumps were raised late in the rulemaking process, the ARB Surveys did not collect information that would allow an estimate of the number of fire pump engines in California or the number of engines in each power configuration. However, based on the Sacramento Metropolitan Air Quality Management District (SMAQMD) permit data and conversations with fire pump distributors, ARB staff believes that the direct-drive diesel fire pumps are the least prevalent. The SMAQMD permit data showed 67 permitted fire pumps with 60 fire pumps being electric with generator backup and seven that we assumed were direct-drive fire pump engines. In addition, John Sweat (of The John Sweat Company), who installs and completes initial testing on fire pumps, and James Feld, a fire protection engineer, indicated that the majority of fire pumps are electric motors connected to the grid, followed by electric powered fire pumps with generator backup. The diesel direct-drives are generally used in remote areas or areas with unreliable power. (Sweat, 2003) (Feld, 2003)

ATCM Proposal for Fire Pump Engines

Based on the reasons discussed above, ARB staff incorporated a provision in the ATCM to allow in-use direct drive diesel fire pumps to continue to operate the annual hours necessary for compliance with NFPA 25 without meeting the performance standards for other emergency standby engines. ARB staff believes it is appropriate to allow these engines to exceed the 30-hour annual cap and not obtain district approval as required for other engines because of NFPA 25 requirements. NFPA 20 requires that diesel fire pump engines be specifically tested and listed for fire pump service by a testing laboratory. Installing an emission control system to modifying the exhaust system may void the UL or FM lab certification. Given the public safety concerns, ARB staff believes that the exemptions for the engines are appropriate.

**B. In-Use Stationary Diesel-Fueled Engines Used in Agricultural Operations**

The proposed Stationary Diesel Engine ATCM establishes performance standards (representing best available control technology) for new agricultural engines similar to the requirements for new emergency standby engines but without operating hour restrictions. New agricultural engines would be required to meet a 0.15 g/bhp-hr PM standard and the NMHC+NOx and CO standards in the U.S. EPA and ARB Non-Road Engine Emission Standards for the specific model year and horsepower category of the engine. New engines meeting the 0.15 g/bhp-hr PM requirement are currently available "off-the-shelf" for all engine horsepower categories greater than 50 hp, even though the certification standards for the engines in the 50 to 175 hp range are higher the 0.15 g/bhp-hr PM standard.

At this time, ARB staff is not proposing any performance standards or operating hour restrictions for in-use agricultural engines as part of the ATCM. For in-use agriculture engines, staff is working with the agricultural community and other parties to identify how best to reduce PM and NOx emission from stationary diesel engines used in agricultural activities. As part of this effort, staff will be following the development of retrofit controls that could be reliably installed and maintained on engines in agricultural uses. If we determine that technically feasible and cost-effective retrofit controls become available for in-use agricultural engines we will propose amendments to the ATCM. Below is a discussion of the rationale for the ARB staff's proposal.

Staff's proposal requires new agricultural engines to be the cleanest currently produced by engine manufacturers. The proposal does not require the installation of retrofit controls for new or in-use agricultural engines, as required for non-agricultural prime engines. At this time, ARB staff believes that it is infeasible to require retrofit controls on new or in-use agricultural engines because of retrofit installation and availability issues unique to engines in agricultural service and the lack of implementation and enforcement mechanisms because these engines are not subject to district permit.

A major factor in staff's decision not to require retrofit controls for new or in-use agricultural engines is retrofit installation and availability issues. Engine manufacturers currently are not producing engines with add-on PM controls for off-road applications and retrofit manufacturers have not offered retrofit controls that can be readily installed on in-use engines in-field locations. The purchaser of a new agricultural engine would have to arrange to have retrofit controls installed after purchase. It would be very difficult for the individual farmer or the local engine dealer to arrange for installation of retrofit controls since it is currently not an option offered by the engine manufacturer or adapted by the retrofit manufacturer. Staff believes that to successfully implement retrofits requirements for engines in agricultural service, bolt-on retrofit kits will be needed. When this occurs, staff is committed to coming back to the Board to amend the ATCM.

In addition to the retrofit installation and availability issue, there are implementation and enforcement issues affecting control of new and in-use agricultural engines. H&SC section 42310 exempts any equipment used in agricultural operations from having to obtain a permit.[17] The ATCM relies on an effective permit system to ensure that controls are properly designed, installed, and operated. Staff believes that it would be extremely difficult and resource intensive to implement retrofit control requirements without a permitting system. Requiring a permit provides a mechanism for obtaining critical data on engine location, make/model, model year, horsepower, and operating hours. More importantly, it provides an enforceable mechanism for the district to obtain the information necessary to determine if the selected equipment is capable of meeting the requirements of the ATCM. Because of the permitting restriction, staff believes that the best approach is to require new agricultural engines to meet the lowest achievable off-road engine standards and to not require retrofits on in-use agricultural engines.

Finally, staff also believes that any effort that would require retrofit controls for new and existing engines needs to be closely coordinated with on-going programs to reduce emissions of both PM and NOx from these engines. This effort is continuing and should

[17] SB 700 was signed into law by Governor Davis on September 22, 2003, and eliminates the exemption from permits in State law for any equipment used in agricultural operations.

be fully integrated with any ATCM requirements for existing engines. Currently a large number of older agricultural engines have been replaced with newer engines meeting the 0.15 g/bhp-hr PM standard and with lower NOx emissions under the Carl Moyer program. Due to increased costs, we believe that requiring retrofit controls on in-use engines may make it less likely that these engines will be removed from service and replaced with electric power. We believe that replacing diesel engines with electric power may be the best long-term approach for reducing PM and NOx emissions from stationary agricultural engines. Because of the factors discussed above, more time and effort is needed to determine how best to further reduce PM emissions from engines in agricultural operations. We plan to report back to the Board by June 2004 with an analysis of the feasibility of converting agricultural diesel engines to electrical power.

## C. Cumulative Risk

The proposed ATCM addresses the emissions from single sources and does not take into consideration the cumulative impacts of multiple sources in close proximity. Concerns have been raised that individual sources may not exceed acceptable regulatory standards, but pose a significant health hazard when the emissions from multiple sources overlap or when there is a high concentration of polluting sources. The ARB is currently developing sophisticated tools to provide information to use in cumulative impact analyses and for use by other agencies such as local air districts and land use planners in addressing cumulative air impacts. These tools include regional risk maps, enhanced air dispersion models, and improved emissions inventories. These tools are data intensive and are still under development.

While the proposed ATCM does not initially address cumulative impacts, it establishes a process to receive information from owners of stationary diesel engines that can be used in future analyses when the tools are fully developed. The reporting requirements of the proposed ATCM will provide information, such as the location of engines, size, emissions, fuel and control equipment. This information may be used in a variety of programs to determine the potential for significant health risks in a cumulative impact analysis. Some of the programs where this type of information may be used to address potential cumulative impacts include local air district permitting, "Hot Spots" Program, or possible development of more stringent regulatory standards at either the State or local level.

## D. Interruptible Service Contracts

Since the mid-1980s, investor-owned utilities are authorized to offer optional "interruptible or curtailable" electric service to customers at discounted rates in exchange for the customer reducing power consumption from the grid during periods when available grid power is insufficient to meet all demand while maintaining an adequate reserve margin. If demand exceeds supply after voluntary interruptions, utilities implement rotating outages based on the Public Utilities Commission authorized curtailment priorities. In exchange for agreeing to have service interrupted, customers receive discounts on their electricity service under interruptible service contracts (ISCs).

In some cases, customers with ISCs operate emergency standby engines as a way to reduce their consumption of power from the grid and, in effect, become self-generators of electricity. These interruptible programs serve as a type of insurance policy against uncertainty and function to provide statewide grid reliability and reduce the probability of experiencing rotating outages or catastrophic system collapse. (PUC, 2002)

Participation in interruptible service programs has decreased over the past several years. In previous years, various programs provided up to 2,800 MW of interruptible load capacity. The same programs provided only 1,600 MW capacity in 2001, and 1,400 MW capacity in 2002. The duration of all interruptible programs were extended through the date of the final decision in the rate design phase of each utility's next general rate case application, i.e., either by the end of 2003 or early 2004. Assembly Bill 425, proposed in the 2003-2004 California State legislative session, proposes to extend the availability of these types of programs or curtailable service to qualified customers until January 1, 2009.

ARB staff could not determine with any certainty the number of facilities operating diesel-fueled engines under ISCs that are associated with the three major investor-owned utilities in California. The Pacific Gas and Electric Company estimates about one third of the 335 MW currently in ISC contracts would be produced by stationary diesel-fueled engines. Southern California Edison could not give an estimate of the number of emergency standby engines in their interruptible load programs. San Diego Gas and Electric has a special type of interruptible program and estimated that they have approximately 60 diesel-fueled stationary engines in their Rolling Blackout Reduction Program.[18] Based on the ARB Survey, approximately 230 of the 3,200 engines for which data was reported in the survey, reported hours of operation in response to an ISC agreement. Of these engines, the average number of hours the engines were used during a low grid power period were about 26 hours per engine per year.

During the development of the ATCM, staff considered how the ATCM should address the continued use of emergency standby engines in interruptible programs. Some entities with existing contracts claimed that operating diesel-fueled emergency standby engines was justified because ISC contracts help prevent blackouts, which could result in the widespread use of diesel-fueled emergency standby engines during rolling blackouts. Others argued against their use, raising concerns about public exposures to diesel PM and continued reliance on a power source that is orders of magnitude dirtier than a gas-fired plant in terms of pollution produced per megawatt of electricity generator.

While possible approaches were explored during the ATCM development, it was not possible to reach agreement on how this issue should be treated prior to the beginning

[18] A special type of ISC is the Rolling Blackout Reduction Program in San Diego County. Under this program, certain engines that have signed up to participate are asked to voluntarily reduce power when grid power reached critically low levels. In exchange for reducing power from the grid, the company is paid 20 cents a kilowatt for the power demand reduced.

of the 45-day public comment period. ARB staff will continue to meet and confer on this issue and may provide a proposal to the Board at the November 13-14, 2003, hearing that would allow the continued use of some of these engine under the proposed ATCM.

## E. Harmonization of the Proposed ATCM and the AB 2588 "Hot Spots" Requirements

The Air Toxics "Hot Spots" Information and Assessment Act (Assembly Bill (AB) 2588) was enacted in September 1987 (Health and Safety Code 44300-44394). The goals of the Air Toxics "Hot Spots" Act are to collect emissions data, to identify facilities having localized impacts, to ascertain health risks, and to notify nearby residents of significant risks. In September 1992, the "Hot Spots" Act was amended by Senate Bill (SB) 1731 to address the reduction of significant risks. The bill requires owners of significant-risk facilities to reduce their risks below the level of significance.

Guidance documents are currently available for conducting emission inventories, facility prioritizations, risk assessments, and public notifications. ARB developed the Emission Inventory Criteria And Guidelines for conducting emission inventories, while CAPCOA developed the Facility Prioritization Guidelines, Risk Assessment Guidelines, and the Public Notification Guidelines. Under these guidelines, diesel fueled engines or facilities with diesel-fueled engines must meet AB 2588 requirements if they use 3,000 or more gallons per year of diesel fuel. Many diesel engine operators, particularly those with emergency standby engines have not been subject to the "Hot Spots" requirements because of this usage requirement. In August 1998, the ARB approved the listing of diesel PM as a TAC and the SRP conclusion that a value of $3 \times 10^{-4}$ $(ug/m^3)^{-1}$ is a reasonable estimate of unit risk from diesel-fueled engines. Now that a unit risk factor has been approved, districts are required to reevaluate the classification of facilities *subject to the "Hot Spots" program, specified in H&SC section 44320, that are operating* stationary diesel-fueled engines.

To assist the districts in this effort, ARB staff is currently developing amendments to the AB 2588 Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines Regulation to address diesel engines. These amendments are being developed to align with the ATCM requirements, avoid duplicative requirements, and ensure that potential risks from all engines are evaluated and mitigated where necessary.

The ARB staff believes that the initial reporting requirement in the ATCM will also fulfill the emission inventory requirement of the "Hot Spots" program. In some cases, compliance with the ATCM will fulfill all requirements under the "Hot Spots" program. For example, for owners of a single emergency standby diesel engine at a facility currently not in the "Hot Spots" program, compliance with the ATCM will also reduce the potential risk from that engine to below 10 in a million. For these engines, compliance with the ATCM will also fulfill the "Hot Spots" requirements, provided the district has a 10 in a million significance level.

For owners of prime engines, multiple prime or emergency standby engines, or engines that are in "Hot Spots" facilities, additional site specific evaluations will likely be needed to determine if the resulting risk is too high and needs to be reduced. It will be important for these facilities to consider the "Hot Spots" requirements concurrent with their obligation under the ATCM, because additional controls above and beyond what are required in the ATCM may be necessary in some cases.

The proposed amendments to the "Hot Spots" Emission Inventory Criteria and Guidelines Regulation are tentatively scheduled to be considered by the Board at the December 2003 hearing. ARB staff expects to conduct additional workshops this fall to further define the necessary modifications to the regulation.

## F. Potential Federal Requirements That May Apply to Stationary Diesel-Fueled Engines

On December 19, 2002, U.S. EPA proposed *The National Emission Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines* (RICE NESHAP or NESHAP) in the Federal Register (40 CFR Part 63). (EPA, 2002) As currently proposed, the RICE NESHAP would establish requirements for stationary internal combustion engines rated above 500 horsepower (hp) that are located at major sources of hazardous air pollutants (HAPs). The comment period for this NESHAP ended on February 18, 2003. The U.S. EPA is in the process of reviewing the comments received. Based on their current schedule, the NESHAP will be promulgated in February 2004. The rule would be effective immediately giving new sources 180 days to comply, and existing sources up to three years to comply.

As proposed, the RICE NESHAP would affect facilities in California that are also subject to the proposed ATCM. The NESHAP requires installation of a diesel oxidation catalyst (DOC) to reduce HAPs (aldehydes) and carbon monoxide. It also includes recordkeeping, monitoring, and testing requirements. Because the NESHAP does not recognize particulate matter (PM) as a public health concern, it is not designed to reduce PM emissions, and it does not allow for the installation of a DPF in lieu of a DOC. As a result, facilities complying with the ATCM may be required to install additional controls and to conduct continuous monitoring with little or no additional environmental benefit. ARB staff raised several concerns regarding the RICE NESHAP proposal including: (1) that the State and Local agencies have authority to regulate PM to reduce diesel exhaust risk, which is also a goal in the Urban Air Toxic Strategy; (2) that the EPA should recognize that DPFs are more effective in reducing diesel engine emissions; and (3) the current definition of "reconstruction" may affect facilities in California using retrofit technologies and may exceed the reconstruction cost threshold. A copy of ARB's comment letter to the U.S. EPA is included in Appendix J.

The U.S. EPA is also in the process of writing a New Source Performance Standard (NSPS) for diesel engines. The NSPS will include controlling emissions, including PM, from existing engines and small diesel engines (as low as 50 hp). With work beginning on the NSPS, the EPA may consider a delay in implementing the diesel engine part of the NESHAP until the NSPS is complete.

The ARB staff will continue to work with the EPA to coordinate both the NESHAP and NSPS requirements with the ARB stationary ATCM.

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# Appendix A

## Proposed Airborne Toxic Control Measure for Stationary Compression Ignition Engines

# PROPOSED REGULATION ORDER

## AIRBORNE TOXIC CONTROL MEASURE FOR STATIONARY COMPRESSION IGNITION ENGINES

Adopt new section 93115, title 17, California Code of Regulations, to read as follows:

**17 CCR, section 93115. Airborne Toxic Control Measure for Stationary Compression Ignition (CI) Engines.**

**(a) Purpose**

The purpose of this airborne toxic control measure (ATCM) is to reduce diesel particulate matter (PM) and criteria pollutant emissions from stationary diesel-fueled compression ignition (CI) engines.

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

**(b) Applicability**

(1) Except as provided in subsection (c), this section applies to any person who either sells a stationary CI engine, offers a stationary CI engine for sale, leases a stationary CI engine, or purchases a stationary CI engine for use in California.

(2) Except as provided in subsection (c), this section applies to any person who owns or operates a stationary CI engine in California with a rated brake horsepower greater than 50 (>50 bhp).

(3) No later than 120 days after the approval of this section by the Office of Administrative Law, each air pollution control and air quality management district (district) shall:

(A) implement and enforce the requirements of this section; or
(B) propose and adopt its own ATCM to reduce diesel PM from stationary diesel-fueled CI engines as provided in Health and Safety Code section 39666(d).

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

**(c) Exemptions**

(1) The requirements of this section do not apply to portable CI engines or CI engines used to provide the motive power for on-road and off-road vehicles.

(2) The requirements of this section do not apply to CI engines used for the propulsion of marine vessels or auxiliary CI engines used on marine vessels.

(3) The requirements of this section do not apply to in-use stationary CI engines used in agricultural operations.

(4) The requirements specified in subsections (e)(2)(A) and (e)(2)(C) do not apply to new stationary CI engines used in agricultural operations.

(5) The requirements specified in subsection (e)(3) do not apply to single cylinder cetane test engines used exclusively to determine the cetane number of diesel fuels in accordance with American Society for Testing and Materials (ASTM) Standard D 613-03b.

(6) The requirements specified in subsections (e)(2)(B)3. and (e)(2)(D)1. do not apply to in-use stationary diesel-fueled CI engines used in emergency standby or prime applications that, prior to January 1, 2005, were required in writing by the district to meet either minimum technology requirements or performance standards implemented by the district from the *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines,* October 2000, which is incorporated herein by reference.

(7) The requirements specified in subsection (e)(2)(B)3. do not apply to permitted in-use stationary emergency standby diesel-fueled CI engines that will be removed from service or replaced prior to January 1, 2009, in accordance with an approved Office of Statewide Health Planning Development (OSHPD) Compliance Plan that has been approved prior to January 1, 2009, except that this exemption does not apply to replacement engines for the engines that are removed from service under the OSHPD plan.

(8) The requirements in subsections (e)(1), (e)(2)(C), and (e)(2)(D) do not apply to any stationary diesel-fueled CI engine used solely for:

(A) the training of United States Air Force (USAF) maintenance officers or enlisted personnel, or civilian government employees of the USAF, and is identified as Class I Training Equipment in accordance with Air Force Space Command Instruction 21-0114, dated March 27, 2000, which is incorporated herein by reference; or
(B) the training of United States (U.S.) Navy personnel, and is identified as a shore based trainer that must be made fully compatible with fleet systems both in configuration and design capability in order to fully support fleet

training requirements and sustain operational readiness, in accordance with Office of the Chief of Naval Operations (OPNAV) Instruction 1500.51B, dated March 31, 1989, which is incorporated herein by reference; or

(C) the training of U.S. Department of Defense (U.S. DoD) students or personnel of any U.S. military branch in the operation, maintenance, repair, and rebuilding of engines, similar to those owned or operated by the U.S. DoD or U.S. military services that are used in combat, combat support, combat service support, tactical or relief operations, or training for such activities.

(9) The requirements specified in subsections (e)(1) and (e)(2) do not apply to stationary diesel-fueled CI engines used solely on San Nicolas or San Clemente Islands. The Ventura County Air Pollution Control District APCO and the South Coast Air Quality Management District APCO shall review the land use plans for the island in their jurisdiction at least once every five (5) years and withdraw this exemption if the land use plans are changed to allow use by the general public of the islands.

(10) The requirements specified in subsection (e)(2) do not apply to stationary diesel-fueled engines used solely on outer continental shelf (OCS) platforms located within 25 miles of California's seaward boundary.

(11) **Request for Exemption for Emergency Engines at Nuclear Facilities.** Consistent with section 39666(d) of the Health and Safety Code, the district APCO may approve a Request for Exemption from the provisions of subsection (e)(2)(B)3. for any in-use stationary diesel-fueled CI engines, provided the approval is in writing, the writing specifies all of the following conditions to be met by the owner or operator, and the writing contains the following information to be provided by the district:

(A) the engine is an emergency standby engine;
(B) the engine is subject to the requirements of the U.S. Nuclear Regulatory Commission;
(C) the engine is used solely for the safe shutdown and maintenance of a nuclear facility when normal power service fails or is lost;
(D) the engine undergoes maintenance and testing operations for no more than 200 hours cumulatively per calendar year; and
(E) the district specifies in the approval any additional criteria that must be met.

(12) **Request for Exemption for Low-Use Prime Engines Outside of School Boundaries.** Consistent with section 39666(d) of the Health and Safety Code, the district APCO may approve a Request for Exemption from the provisions of subsection (e)(2)(D)1. for any in-use stationary diesel-fueled CI engine located beyond school boundaries, provided the approval is in writing, the writing specifies all of the following conditions to be met by the owner or operator, and the writing contains the following information to be provided by the district:

(A) the engine is a prime engine;
(B) the engine is located more than 1000 feet from a school at all times; and
(C) the engine operates no more than 20 hours cumulatively per year.

(13) The requirements in subsections (e)(2)(B)3. and (e)(2)(D)1. do not apply to in-use dual-fueled diesel pilot CI engines that use an alternative fuel or an alternative diesel fuel.

(14) The requirements in subsection (e)(1), (e)(2)(A)3., (e)(2)(B)3., (e)(2)(C)1., and (e)(2)(D)1. do not apply to dual-fueled diesel pilot CI engines that use diesel fuel and digester gas or landfill gas.

(15) The requirements in subsections (e)(2)(B)3. and (e)(2)(D)1. do not apply to in-use stationary diesel-fueled CI engines that have selective catalytic reduction systems.

(16) The requirements of subsection (e)(2)(B)3. do not apply to in-use emergency fire pump assemblies that are driven directly by stationary diesel- fueled CI engines and only operated the number of hours necessary to comply with the testing requirements of National Fire Protection Association (NFPA) 25 - *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 1998 edition, as referenced through NFPA 13 - *Standard for the Installation of Sprinkler Systems,* 1999 edition, in the 2001 California Building Code, 24 CCR part 2, vol. 2, chapter 35, Uniform Building Code Standards, all three of which are incorporated herein by reference.

(17) The requirements of subsection (e)(1), (e)(2)(A)3., (e)(2)(B)3., (e)(2)(C), and (e)(2)(D) do not apply to any stationary diesel-fueled CI engine used to power equipment that is owned by the National Aeronautics and Space Administration (NASA) and used solely at a space shuttle landing site, provided the District APCO approves this exemption in writing consistent with section 39666(d) of the Health and Safety Code. This exemption only applies to diesel engines that power equipment which is maintained in the same configuration as similar equipment at all space shuttle facilities.

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

**(d) Definitions**

For purposes of this section, the following definitions apply:

(1) "Agricultural Operations" means the growing and harvesting of crops or the raising of fowl or animals for the primary purpose of making a profit, providing a

livelihood, or conducting agricultural research or instruction by an educational institution. Agricultural operations do not include activities involving the processing or distribution of crops or fowl.

(2) "Air Pollution Control Officer" means the Executive Officer or director of a district, or his or her designated representative.

(3) "Alternative Fuel" means natural gas, propane, ethanol, or methanol.

(4) "Alternative Diesel Fuel" means any fuel used in a CI engine that is not a reformulated CARB diesel fuel as defined in Title 13 CCR Sections 2281 and 2282 or an alternative fuel, and does not require engine or fuel system modifications for the engine to operate, although minor modifications (e.g., recalibration of the engine fuel control) may enhance performance. Examples of alternative diesel fuels include, but are not limited to, biodiesel; Fischer-Tropsch fuels; emulsions of water in diesel fuel; and fuels with a fuel additive, unless:

(A) the additive is supplied to the engine fuel by an on-board dosing mechanism, or
(B) the additive is directly mixed into the base fuel inside the fuel tank of the engine, or
(C) the additive and base fuel are not mixed until engine fueling commences, and no more additive plus base fuel combination is mixed than required for a single fueling of a single engine.

(5) "Approach Light System with Sequenced Flasher Lights in Category 1 and Category 2 Configurations (ALSF-1 and ALSF-2)" means high intensity approach lighting systems with sequenced flashers used at airports to illuminate specified runways during category II or III weather conditions, where category II means a decision height of 100 feet and runway visual range of 1,200 feet, and category III means no decision height or decision height below 100 feet and runway visual range of 700 feet.

(6) "Baseline or Baseline Emissions" means the emissions level of a diesel-fueled engine using CARB diesel fuel as configured upon initial installation or by January 1, 2003, whichever is later.

(7) "California Air Resources Board (CARB) Diesel Fuel" means any diesel fuel that meets the specifications defined in subsection (d)(12) and meets the specifications defined in title 13 CCR, sections 2281-2282.

(8) "Carbon Monoxide (CO)" is a colorless, odorless gas resulting from the incomplete combustion of hydrocarbon fuels.

(9) "Compression Ignition (CI) Engine" means an internal combustion engine with operating characteristics significantly similar to the theoretical diesel combustion cycle. The regulation of power by controlling fuel supply in lieu of a throttle is indicative of a compression ignition engine.

(10) "Control Area" means any electrical region in California that regulates its power generation in order to balance electrical loads and maintain planned interchange schedules with other control areas.

(11) "Cumulatively" means the aggregation of hours or days of engine use, and any portion of an hour or day of engine use, toward a specified time limit(s).

(12) "Diesel Fuel" means any fuel that meets the American Society for Testing and Materials (ASTM) D975-03, *Standard Specification for Diesel Fuel Oils*, which is incorporated herein by reference. "Diesel Fuel" includes, but is not limited to, No. 1-D, No. 1-D low sulfur, No. 2-D, No. 2-D low sulfur, and No. 4-D diesel fuel oils.

(13) "Diesel-Fueled" means fueled by diesel fuel, CARB diesel fuel, or jet fuel, in whole or part.

(14) "Diesel Particulate Filter (DPF)" means an emission control technology that reduces PM emissions by trapping the particles in a flow filter substrate and periodically removes the collected particles by either physical action or by oxidizing (burning off) the particles in a process called regeneration.

(15) "Diesel Particulate Matter (PM)" means the particles found in the exhaust of diesel-fueled CI engines as determined in accordance with the test methods identified in subsection (i).

(16) "Digester Gas" is any gas derived from anaerobic decomposition of organic matter.

(17) "District" means an air pollution control district or air quality management district created or continued in existence pursuant to provisions of Part 3 (commencing with section 40000) of the California Health and Safety Code. Each district is headed by an Air Pollution Control Officer (APCO).

(18) "Dual-fuel Diesel Pilot Engine" means a dual-fueled engine that uses diesel fuel as a pilot ignition source at an annual average ratio of less than 5 parts diesel fuel to 100 parts total fuel on an energy equivalent basis.

(19) "Dual-fuel Engine" means any CI engine that is engineered and designed to operate on a combination of alternative fuels, such as compressed natural gas (CNG) or liquefied petroleum gas (LPG) and diesel fuel or an alternative diesel

fuel. These engines have two separate fuel systems, which inject both fuels simultaneously into the engine combustion chamber.

(20) "Emergency Standby Engine" means a stationary engine operated solely during an emergency use, except as otherwise permitted for maintenance and testing operations, emission testing, to provide power in response to the notification of an impending rotating outage, and initial start-up testing, as specified in (e)(2)(A) and (e)(2)(B).

(21) "Emergency Use" means providing electrical power or mechanical work during any of the following events and subject to the following conditions:

(A) the failure or loss of all or part of normal electrical power service or normal natural gas supply to the facility:
1. which is caused by any reason other than the enforcement of a contractual obligation the owner or operator has with a third party or any other party; and
2. which is demonstrated by the owner or operator to the district APCO's satisfaction to have been beyond the reasonable control of the owner or operator;

(B) the failure of a facility's internal power distribution system:
1. which is caused by any reason other than the enforcement of a contractual obligation the owner or operator has with a third party or any other party; and
2. which is demonstrated by the owner or operator to the district APCO's satisfaction to have been beyond the reasonable control of the owner or operator;

(C) the pumping of water or sewage to prevent or mitigate a flood or sewage overflow;

(D) the pumping of water for fire suppression or protection;

(E) the powering of ALSF-1 and ALSF-2 airport runway lights under category II or III weather conditions.

(22) "Emission Control Strategy" means any device, system, or strategy employed with a diesel-fueled CI engine that is intended to reduce emissions including, but not limited to, particulate filters, diesel oxidation catalysts, selective catalytic reduction systems, fuel additives used in combination with particulate filters, alternative diesel fuels, and any combination of the above.

(23) "End User" means any person who purchases or leases a stationary diesel-fueled engine for operation in California. Persons purchasing engines for resale are not considered "end users."

(24) "Executive Officer" means the executive officer of the Air Resources Board, or his or her designated representative.

(25) "Facility" means one or more contiguous properties, in actual physical contact or separated solely by a public roadway or other public right-of-way, under common ownership on which engines operate.

(26) "Fuel Additive" means any substance designed to be added to fuel or fuel systems or other engine-related engine systems such that it is present in-cylinder during combustion and has any of the following effects: decreased emissions, improved fuel economy, increased performance of the engine; or assists diesel emission control strategies in decreasing emissions, or improving fuel economy or increasing performance of the engine.

(27) "Generator Set" means a CI engine coupled to a generator that is used as a source of electricity.

(28) "Hydrocarbon (HC)" means the sum of all hydrocarbon air pollutants.

(29) "In-Use" means a CI engine that is not a "new" CI engine.

(30) "Initial Start-up Testing" means operating the engine or supported equipment to ensure their proper performance either:

(A) for the first time after initial installation of a new stationary diesel-fueled CI engine at a facility, or
(B) for the first time after installation of emission control equipment on an in-use stationary diesel-fueled CI engine.

(31) "Jet Fuel" means fuel meeting any of the following specifications:

(A) ASTM D 1655-02, *Standard Specification for Aviation Turbine Fuels*, which is incorporated herein by reference. Jet fuels meeting this specification includes Jet A, Jet A-1, and Jet B;
(B) Military Detail (MIL-DTL) 5624T, *Turbine Fuels, Aviation, Grades Jet Propellant (JP) JP-4, JP-5, and JP-5/JP8 ST*, dated September 18, 1998, which is incorporated herein by reference; and
(C) Military Test (MIL-T) 83133E, *Turbine Fuels, Aviation, Kerosene Types, North Atlantic Treaty Organization (NATO) F-34 (JP-8), NATO F-35* and *JP-8+100*, dated April 1, 1999, which is incorporated herein by reference.

(32) "Landfill Gas" means any gas derived through any biological process from the decomposition of waste buried within a waste disposal site.

(33) "Location" means any single site at a facility.

(34) "Maintenance and Testing" means operating an emergency standby CI engine to evaluate the ability of the engine or its supported equipment to perform

during an emergency. Supported equipment includes, but is not limited to, generators, pumps, transformers, switchgear, and breakers.

(35) "Model Year" means the stationary CI engine manufacturer's annual production period, which includes January 1st of a calendar year, or if the manufacturer has no annual production period, the calendar year.

(36) "New" or "New CI Engine" means the following:

(A) a stationary CI engine installed at a facility after January 1, 2005, including an engine relocated from an off-site location after January 1, 2005, except the following shall be deemed in-use engines:

1. a replacement stationary CI engine that is installed to temporarily replace an in-use engine while the in-use engine is undergoing maintenance and testing, provided the replacement engine emits no more than the in-use engine and the replacement engine is not used more than 180 days cumulatively in any 12-month rolling period;
2. an engine that was approved by the District for installation prior to the effective date of this section but is not installed until after January 1, 2005;
3. an engine that is one of four or more engines owned by an owner or operator and is relocated prior to January 1, 2008 to an offsite location that is owned by the same owner or operator;
4. an engine installed prior to or on January 1, 2005 in a facility used in agricultural operations that is owned by an owner or operator, which is subsequently relocated to an offsite location that is owned by the same owner or operator.

(B) a stationary CI engine that has been reconstructed after January 1, 2005 shall be deemed a new engine unless:

1. the sum of the costs of all individual reconstructions of that engine after January 1, 2005 is less than 50% of the lowest-available purchase price, determined at the time of the most recent reconstruction, of a complete, comparably-equipped new engine (within ±10% of the reconstructed engine's brake horsepower rating).

For purposes of this definition, the cost of reconstruction and the cost of a comparable new engine shall not include the cost of equipment and devices required to meet the requirements of this ATCM.

(37) "Nitrogen Oxides (NOx)" means compounds of nitric oxide (NO), nitrogen dioxide ($NO_2$), and other oxides of nitrogen, which are typically created during combustion processes and are major contributors to smog formation and acid deposition.

(38) "Non-Methane Hydrocarbons (NMHC)" means the sum of all hydrocarbon air pollutants except methane.

(39) "Owner or Operator" means any person subject to the requirements of this section, including but not limited to:

(A) an individual, trust, firm, joint stock company, business concern, partnership, limited liability company, association, or corporation including but not limited to, a government corporation; and
(B) any city, county, district, commission, the state or any department, agency, or political subdivision thereof, any interstate body, and the federal government or any department or agency thereof to the extent permitted by law.

(40) "Particulate Matter (PM)" means the particles found in the exhaust of CI engines, which may agglomerate and adsorb other species to form structures of complex physical and chemical properties.

(41) "Portable CI Engine" means a compression ignition (CI) engine designed and capable of being carried or moved from one location to another, except as provided in subsection (d)(50). Indicators of portability include, but are not limited to, wheels, skids, carrying handles, dolly, trailer, or platform. The provisions of this definition notwithstanding, an engine with indicators of portability that remains at the same facility location for more than 12 consecutive rolling months or 365 rolling days, whichever occurs first, not including time spent in a storage facility, shall be deemed a stationary engine.

(42) "Prime CI Engine" means a stationary CI engine that is not an emergency standby CI engine.

(43) "Rated Brake Horsepower" means the maximum horsepower rating for an engine, as specified by the manufacturer or manufacturer-authorized engine dealer or distributor and listed on the nameplate of the unit.

(44) "Receptor location" means any location outside the boundaries of a facility where a person may experience exposure to diesel exhaust due to the operation of a stationary diesel-fueled CI engine. Receptor locations include, but are not limited to, residences, businesses, hospitals, daycare centers, and schools.

(45) "Reconstruction" means the rebuilding of the engine or the replacement of engine parts, including pollution control devices, but excluding operating fluids; lubricants; and consumables such as air filters, fuel filters, and glow plugs that are subject to regular replacement.

(46) "Rotating Outage" means a controlled, involuntary curtailment of electrical power service to consumers as ordered by the Utility Distribution Company.

(47) "School" means any public or private school used for purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes.

(48) "Selective Catalytic Reduction (SCR) System" means an emission control system that reduces NOx emissions through the catalytic reduction of NOx in diesel exhaust by injecting nitrogen-containing compounds into the exhaust stream, such as ammonia or urea.

(49) "Seller" means any person who sells, leases, or offers for sale any stationary diesel-fueled engine directly to end users.

(50) "Stationary CI Engine" means a CI engine that is designed to stay in one location, or remains in one location. A CI engine is stationary if any of the following are true:

(A) the engine or its replacement is attached to a foundation, or if not so attached, will reside at the same location for more than 12 consecutive months. Any engine such as backup or standby engines, that replaces an engine at a location and is intended to perform the same or similar function as the engine(s) being replaced, shall be included in calculating the consecutive time period. The cumulative time of all engine(s), including the time between the removal of the original engine(s) and installation of the replacement engine(s), will be counted toward the consecutive time period; or

(B) the engine remains or will reside at a location for less than 12 consecutive months if the engine is located at a seasonal source and operates during the full annual operating period of the seasonal source, where a seasonal source is a stationary source that remains in a single location on a permanent basis (at least two years) and that operates at that single location at least three months each year; or

(C) the engine is moved from one location to another in an attempt to circumvent the 12 month residence time requirement. The period during which the engine is maintained at a storage facility shall be excluded from the residency time determination.

(51) "Stationary Source" means an emission unit or aggregation of emission units which are located on the same or contiguous properties and which units are under common ownership or entitlement to use. Stationary sources also include those emission units or aggregation of emission units located in the California Coastal Waters. "Emission Unit" means any article, machine,

equipment, contrivance, process, or process line that emit(s) or reduce(s), or may emit or reduce, the emissions of any air contaminant, except motor vehicles.

(52) "Utility Distribution Company" means one of several organizations that control energy transmission and distribution in California. Utility Distribution Companies include, but are not limited to, the Pacific Gas and Electric Company, the San Diego Gas and Electric Company, Southern California Edison, Los Angeles Department of Water and Power, the Imperial Irrigation District, and the Sacramento Municipal Utility District.

(53) "Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines (Verification Procedure)" means the ARB regulatory procedure codified in title 13, CCR, sections 2700-2710, which is incorporated herein by reference, that engine manufacturers, sellers, owners, or operators may use to verify the reductions of diesel PM or NOx from in-use diesel engines using a particular emission control strategy.

(54) "Verified Diesel Emission Control Strategy" means an emission control strategy, designed primarily for the reduction of diesel PM emissions, which has been verified pursuant to the Verification Procedure.

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

**(e) Requirements**

(1) Fuel and Fuel Additive Requirements for New and In-Use Stationary CI Engines That Have a Rated Brake Horsepower of Greater than 50

(A) As of January 1, 2005, except as provided for in subsection (c), all new stationary CI engines and all in-use stationary diesel-fueled CI engines shall use only:

1. CARB Diesel Fuel, or
2. an alternative diesel fuel that meets the requirements of the Verification Procedure, or
3. an alternative fuel, or
4. CARB Diesel Fuel used with fuel additives that meets the requirements of the Verification Procedure, or
5. any combination of (e)(1)(A)1. through (e)(1)(A)4. above.

(2) Operating Requirements and Emission Standards for New and In-Use Stationary Diesel-Fueled CI Engines That Have a Rated Brake Horsepower of Greater than 50 (>50 bhp).

(A) ***New Emergency Standby Diesel-Fueled CI Engine (>50 bhp) Operating Requirements and Emission Standards***

1. No new stationary emergency standby diesel-fueled CI engine (>50 bhp) located on school grounds shall operate for non-emergency use, including maintenance and testing purposes, when any school-sponsored activities are taking place.

2. No new stationary emergency standby diesel-fueled CI engine (>50 bhp) shall operate in response to the notification of an impending rotating outage, unless the following criteria are met:

   a. the engine's permit to operate allows operation of the engine in anticipation of a rotating outage, or the District has established a policy or program that authorizes operation of the engine in anticipation of a rotating outage; and

   b. the Utility Distribution Company has ordered rotating outages in the control area where the engine is located, or has indicated it expects to issue such an order at a specified time; and

   c. the engine is located in a control area that is subject to the rotating outage; and

   d. the engine is operated no more than 30 minutes prior to the time when the Utility Distribution Company officially forecasts a rotating outage in the control area; and

   e. the engine operation is terminated immediately after the Utility Distribution Company advises that a rotating outage is no longer imminent or in effect.

3. As of January 1, 2005, except as provided in subsection (c), no person shall sell, offer for sale, purchase, or lease for use in California any stationary emergency standby diesel-fueled CI engine that has a rated brake horsepower greater than 50 unless it meets the following applicable emission standards, and no person shall operate any new stationary emergency standby diesel-fueled CI engine that has a rated brake horsepower greater than 50, unless it meets all of the following applicable operating requirements and emission standards which are summarized in Table I:

a. Diesel PM Standard and Hours of Operating Requirements

I. General Requirements: New stationary emergency standby diesel-fueled engines (>50 bhp) shall:

i. emit diesel PM at a rate less than or equal to 0.15 g/bhp-hr; or
ii. meet the current model year diesel PM standard specified in the Off-Road Compression Ignition Engine Standards for off-road engines with the same horsepower rating (Title 13 CCR section 2423), whichever is more stringent; and
iii. not operate more than 50 hours per year for maintenance and testing purposes. This subsection does not limit engine operation for emergency use and for emission testing to show compliance with (e)(2)(A)3.

II. Consistent with section 39666(d) of the Health and Safety Code, the District may allow a new emergency standby diesel-fueled CI engine (> 50 hp) to operate up to 100 hours per year for maintenance and testing purposes on a site-specific basis, provided the diesel PM emission rate is less than or equal to 0.01 g/bhp-hr.

<table>
<tr><th colspan="5">TABLE 1: SUMMARY OF THE EMISSION STANDARDS AND OPERATING REQUIREMENTS FOR NEW STATIONARY EMERGENCY STANDBY DIESEL-FUELED CI ENGINES > 50 BHP (SEE SUBSECTION (e)(2)(A)3.)</th></tr>
<tr><th colspan="4">DIESEL PM</th><th>OTHER POLLUTANTS</th></tr>
<tr><th rowspan="3">DIESEL PM STANDARDS (g/bhp-hr)</th><th colspan="3">MAXIMUM ALLOWABLE ANNUAL HOURS OF OPERATION FOR ENGINES MEETING DIESEL PM STANDARDS</th><th rowspan="3">HC, NOx, NMHC+NOX, AND CO STANDARDS (g/bhp-hr)</th></tr>
<tr><th rowspan="2">Emergency Use</th><th colspan="2">Non-Emergency Use</th></tr>
<tr><th>Emission Testing to show compliance[2]</th><th>Maintenance & Testing (hours/year)</th></tr>
<tr><td>≤0.15[1]</td><td>Not Limited by ATCM[3]</td><td>Not Limited by ATCM[3]</td><td>50</td><td rowspan="2">Off-Road CI Engine Certification Standards for an off-road engine of the same model year and horsepower rating, or Tier 1 standards for an off-road engine of the same horsepower rating.[4]</td></tr>
<tr><td>≤0.01[1]</td><td>Not Limited by ATCM[3]</td><td>Not Limited by ATCM[3]</td><td>51 to 100 (Upon approval by the District)</td></tr>
</table>

1. Or off-road certification standard (title 13 CCR section 2423) for an off-road engine with the same horsepower rating, whichever is more stringent
2. Emission testing limited to testing to show compliance with subsections (e)(2)(A)3.
3. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.
4. The option to comply with the Tier 1 standards is available only if no off-road engine certification standards have been established for an off-road engine of the same model year and brake horsepower rating as the new stationary emergency standby diesel-fueled CI engine.

b. HC, NOx, NMHC + NOx, and CO standards: New stationary emergency standby diesel-fueled CI engines (> 50 bhp) must meet the standards for off-road engines of the same model year and horsepower rating as specified in the Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423). If no standards have been established for an off-road engine of the same model year and horsepower rating as the new stationary emergency standby diesel-fueled CI engine, then the new stationary emergency standby diesel-fueled CI engine shall meet the Tier 1 standards in title 13, CCR, section 2423 for an off-road engine of the same horsepower rating, irrespective of the new stationary emergency standby diesel-fueled CI engine's model year.

c. Consistent with section 39666(d) of the Health and Safety Code, the District:

   I. may establish more stringent diesel PM, NMHC+NOx, HC, NOx, and CO emission rate standards; and
   II. may establish more stringent maintenance and testing hour of operation standards on a site-specific basis; and
   III. shall determine an appropriate limit on the number of hours of operation for demonstrating compliance with other District rules and initial start-up testing.

(B) ***In-Use Emergency Standby Diesel-Fueled CI Engine (> 50 bhp) Operating Requirements and Emission Standards***

1. No in-use stationary emergency standby diesel-fueled CI engine may be operated in response to the notification of an impending rotating outage if the following criteria are met:

   a. the engine's permit to operate allows operation of the engine in anticipation of a rotating outage, or the District has established a policy or program that authorizes operation of the engine in anticipation of a rotating outage; and

   b. the Utility Distribution Company has ordered rotating outages in the control area where the engine is located, or has indicated it expects to issue such an order at a certain time; and

   c. the engine is located in a control area that is subject to the rotating outage; and

   d. the engine is operated no more than 30 minutes prior to the time when the Utility Distribution Company officially forecasts a rotating outage in the control area; and

e. the engine operation is terminated immediately after the Utility Distribution Company advises that a rotating outage is no longer imminent or in effect.

2. No in-use stationary emergency standby diesel-fueled CI engine (> 50 bhp) located on school grounds shall operate for non-emergency use, including for maintenance and testing purposes, when school activities are taking place.

3. Except as provided in subsection (c), all in-use stationary emergency standby diesel-fueled CI engines (> 50 hp) operated in California shall meet, in accordance with the applicable compliance schedules specified in subsections (f) and (g), the following requirements (which are summarized in Table 2):

<table>
<tr><th colspan="5">TABLE 2: SUMMARY OF THE EMISSION STANDARDS AND OPERATING REQUIREMENTS FOR IN-USE STATIONARY EMERGENCY STANDBY DIESEL-FUELED CI ENGINES > 50 BHP (SEE SUBSECTION (e)(2)(B)3.)</th></tr>
<tr><th colspan="4">DIESEL PM</th><th>OTHER POLLUTANTS</th></tr>
<tr><th rowspan="3">DIESEL PM STANDARDS (g/bhp-hr)</th><th colspan="3">MAXIMUM ALLOWABLE ANNUAL HOURS OF OPERATION FOR ENGINES MEETING DIESEL PM STANDARDS</th><th rowspan="3">HC, NOx, NMHC+NOX, AND CO STANDARDS (g/bhp-hr)</th></tr>
<tr><th rowspan="2">Emergency Use</th><th colspan="2">Non-Emergency Use</th></tr>
<tr><th>Emission Testing to show compliance[1]</th><th>Maintenance & Testing (hours/year)</th></tr>
<tr><td>Not limited by ATCM[2]</td><td>Not Limited by ATCM[2]</td><td>Not Limited by ATCM[2]</td><td>20</td><td rowspan="4">Both (i) and (ii) must be met::<br>(i) No increase in HC or NOx above 10% from baseline levels<br>OR<br>No increase in NMHC+NOx emissions above baseline levels<br>(ii) No increase in CO above 10% from baseline levels</td></tr>
<tr><td>≤0.40</td><td>Not Limited by ATCM[2]</td><td>Not Limited by ATCM[2]</td><td>21 to 30</td></tr>
<tr><td>≥ 0.40 and ≤ 0.15</td><td>Not Limited by ATCM[2]</td><td>Not Limited by ATCM[2]</td><td>31 to 50 (Upon approval by the District)</td></tr>
<tr><td>≥ 0.15 and ≤ 0.01</td><td>Not Limited by ATCM[2]</td><td>Not Limited by ATCM[2]</td><td>51 to 100 (Upon approval by the District)</td></tr>
</table>

1. Emission testing limited to testing to show compliance with subsections (e)(2)(B)3.
2. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.

a. Diesel PM Standard and Hours of Operation Limitations

I. General Requirements:

i. No in-use stationary emergency standby diesel-fueled CI engine (>50 bhp) that emits diesel PM at a rate greater than 0.40 g/bhp-hr shall operate more than 20 hours per year for maintenance and testing purposes. This section does not limit engine operation for emergency use and for emission testing to show compliance with (e)(2)(B)3.

ii. No in-use stationary emergency standby diesel-fueled CI engine (>50 bhp) that emits diesel PM at a rate less than or equal to 0.40 g/bhp-hr shall operate more than 30 hours per year for maintenance and testing purposes. This section does not limit engine operation for emergency use and for emission testing to show compliance with (e)(2)(B)3.

III. Consistent with section 39666(d) of the Health and Safety Code, the District may allow in-use stationary emergency standby diesel-fueled CI engines (> 50 bhp) to operate more than 30 hours per year for maintenance and testing purposes on a site-specific basis, provided the following limits are met:

i. Up to 50 annual hours of operation are allowed for maintenance and testing purposes if the diesel PM emission rate is less than or equal to 0.15 g/bhp-hr.

ii. Up to 100 annual hours of operation are allowed for maintenance and testing purposes if the diesel PM emission rate is less than or equal to 0.01 g/bhp-hr.

b. Additional Standards:

I. Owners or operators that choose to meet the diesel PM standards defined in subsection (e)(2)(B)3.a. with emission control strategies that are not verified through the Verification Procedure shall:

i. not increase HC or NOx emission rates by more than 10% above baseline, or
ii. not increase the sum of NMHC and NOx emission rates above baseline, and

iii. not increase CO emission rates by more than 10% above baseline.

c. Consistent with section 39666(d) of the Health and Safety Code, the District:

I. may establish more stringent diesel PM, NMHC+NOx, HC, NOx, and CO emission rate standards; and
II. may establish more stringent limits on hours of maintenance and testing on a site-specific basis; and
III. shall determine an appropriate limit on the number of hours of operation for demonstrating compliance with other District rules and initial start-up testing.

(C) ***New Stationary Prime Diesel-Fueled CI Engine (> 50 bhp) Emission Standards***

1. As of January 1, 2005, except as provided in subsection (c), no person shall sell, purchase, or lease for use in California a new stationary prime diesel-fueled CI engine that has a rated brake horsepower greater than 50 unless it meets the following applicable emission standards, and no person shall operate any new stationary prime diesel-fueled CI engine that has a rated brake horsepower greater than 50 that unless its meets all of the following emission standards and operational requirements (which are summarized in Table 3):

| TABLE 3: SUMMARY OF THE EMISSION STANDARDS FOR NEW STATIONARY PRIME DIESEL-FUELED CI ENGINES > 50 BHP (SEE SUBSECTION (e)(2)(C)1.) | |
|---|---|
| **DIESEL PM STANDARDS (g/bhp-hr)** | **HC, NOx, NMHC+NOX, AND CO STANDARDS (g/bhp-hr)** |
| Meet the more stringent of:<br>$\leq 0.01$[1]<br>OR<br>Off-Road CI Engine Certification Standard for an off-road engine of the same horsepower rating | Off-Road CI Engine Certification Standard for an off-road engine of the same model year and horsepower rating, or Tier 1 standard for an off-road engine of the same horsepower rating.[1,2] |

1. May be subject to additional emission limitations as specified in current district rules, regulations, or policies governing distributed generation.
2. The option to comply with the Tier 1 standards is available only if no off-road engine certification standards have been established for an off-road engine of the same model year and brake horsepower rating as the new stationary emergency standby diesel-fueled CI engine.

a. Diesel PM Standard: All new stationary prime diesel-fueled CI engines (> 50 bhp) shall either emit diesel PM at a rate that is less than or equal to 0.01 grams diesel PM per brake-horsepower-hour (g/bhp-hr) or shall meet the current off-road PM certification standard for off-road engines of the same horsepower rating (title 13, CCR, section 2423), whichever is more stringent;

b. HC, NOx, NMHC+NOx, and CO Standards: All new stationary prime diesel-fueled CI engines (> 50 bhp) shall meet the standards for off-road engines of the same model year and horsepower rating as specified in the Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423). If no limits have been established for an off-road engine of the same model year and horsepower rating as the new stationary prime diesel-fueled CI engine, then the new stationary prime diesel-fueled CI engine shall meet the Tier 1 standards in title 13, CCR, section 2423, for an off-road engine of the same horsepower rating, irrespective of the new stationary prime diesel-fueled CI engine's model year;

c. New stationary prime diesel-fueled CI engines that are used to provide electricity near the place of use (also known as "distributed generation") may be subject to additional emission limitations as specified in current district rules, policies, or regulations governing distributed generation;

d. Consistent with section 39666(d) of the Health and Safety Code, the District may establish more stringent diesel PM, NMHC+NOx, HC, NOx, and CO emission rate limits on a site-specific basis.

(D) ***In-Use Stationary Prime Diesel-Fueled CI Engine (> 50 bhp) Emission Standards***

1. Except as provided in subsection (c), all in-use stationary prime diesel-fueled CI engines (> 50 bhp) operated in California shall meet the following requirements (which are summarized in Table 4):

**TABLE 4: SUMMARY OF THE EMISSION STANDARDS FOR IN-USE STATIONARY PRIME DIESEL-FUELED CI ENGINES > 50 BHP (SEE SUBSECTION (e)(2)(D)1.)**

| DIESEL PM | | OTHER POLLUTANTS |
|---|---|---|
| **DIESEL PM STANDARDS (g/bhp-hr)** | | **HC, NOx, NMHC+NOX, AND CO STANDARDS (g/bhp-hr)** |
| **Applicability** | **Standard** | |
| All in-use prime engines (both off-road certified and not off-road certified) | 85% reduction from baseline levels (Option 1) OR 0.01 g/bhp/hr (Option 2) | Both (i) and (ii) must be met: (i) No increase in HC or NOx emissions above 10% from baseline levels OR No increase in NMHC+NOx emissions above baseline levels (ii) No increase in CO above 10% from baseline levels |
| Only in-use prime engines NOTcertified in accordance with the Off-Road Compression Ignition Standards | 30% reduction from baseline levels AND 0.01 g/bhp-hr by no later than July 1, 2011 (Option 3) | |

a. Diesel PM Standards: All in-use stationary prime diesel-fueled CI engines (> 50 bhp) certified in accordance with the Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423) shall comply with either option 1 or option 2 below. All engines not certified in accordance with the Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423) shall comply with option 1, option 2, or option 3 below:

I. Option 1: Reduce the diesel PM emission rate by at least 85 percent, by weight, from the baseline level, in accordance with the appropriate compliance schedule specified in subsections (f) and (g),

II. Option 2: Emit diesel PM at a rate less than or equal to 0.01 g/bhp-hr in accordance with the appropriate compliance schedule as specified in subsections (f) and (g),

III. Option 3: Reduce the diesel PM emission rate by at least 30% from the baseline level, by no later than January 1, 2006, and emit diesel PM at a rate of 0.01 g/bhp-hr or less by no later than July 1, 2011.

b. Additional Standards:

I. Owners or operators that choose to meet the diesel PM limits defined in subsection (e)(2)(D)1.a. with emission control strategies that are not verified through the Verification Procedure shall:

i. not increase HC or NOx emission rates by more than 10% above baseline, or
ii. not increase the sum of NMHC and NOx emission rates above baseline, and
iii. not increase CO emission rates by more than 10% above baseline.

c. Consistent with section 39666(d) of the Health and Safety Code, the District may establish more stringent diesel PM, NMHC+NOx, HC, NOx, and CO emission rate standards.

(E) ***Emission Standards for New Stationary Diesel-Fueled CI Engines (> 50 bhp) Used in Agricultural Operations***

1. As of January 1, 2005, except as provided in subsection (c) and subsection (e)(2)(E)2., no person shall sell, purchase, or lease for use in California any stationary diesel-fueled engine to be used in agricultural operations that has a rated brake horsepower greater than 50, or operate any new stationary diesel-fueled engine to be used in agricultural operations that has a rated brake horsepower greater than 50, unless the engine meets all of the following emission performance standards (which are summarized in Table 5.):

**TABLE 5: SUMMARY OF THE EMISSION STANDARDS FOR NEW STATIONARY DIESEL-FUELED CI ENGINES > 50 BHP USED IN AGRICULTURAL OPERATIONS (SEE SUBSECTION (e)(2)(E))**

| DIESEL PM | OTHER POLLUTANTS |
|---|---|
| **DIESEL PM STANDARDS (g/bhp-hr)** | **HC, NOx, NMHC+NOX, AND CO STANDARDS (g/bhp-hr)** |
| $\leq$0.15[1] OR Off-Road CI Engine Certification Standard for an off-road engine of the same horsepower rating, whichever is more stringent. | Off-Road CI Engine Certification Standard for an off-road engine of the same model year and horsepower rating, or Tier 1 standard for an off-road engine of the same horsepower rating.[1] |

1. Prior to January 1, 2008, these limits shall not apply to engines funded under State or federal incentive funding programs.

a. Diesel PM Standard: New agricultural stationary diesel-fueled CI engines shall emit no more than 0.15 g/bhp-hr diesel particulate matter (PM) limit or shall meet the current standards for off-road engines of the same horsepower rating as specified in the Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423), whichever is lower; and

b. NMHC, NOx, and CO Standards: New agricultural stationary diesel-fueled CI engines shall meet the HC, NOx, (or NMHC+NOx, if applicable) and CO standards for off-road engines of the same model year and horsepower rating, as specified in the Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423). If no limits have been established for an off-road engine of the same model year and horsepower rating as the new agricultural stationary diesel-fueled CI engine, then the new agricultural stationary diesel-fueled CI engine shall meet the Tier 1 standards in title 13, CCR, section 2423, for an off-road engine of the same horsepower rating, irrespective of the new agricultural diesel-fueled CI engine's model year.

2. Prior to January 1, 2008, the requirements of subsections (e)(2)(E)1. shall not apply to any stationary diesel-fueled CI engine that:

a. is used in agricultural operations, and

b. was funded under a State or federal incentive funding program, and

c. was sold for use in another agricultural operation, provided the stationary diesel-fueled CI engine complies with Tier II Off-Road Compression Ignition Standards for off-road engines of the same horsepower rating (title 13, CCR, section 2423).

For purposes of this subsection, State or federal incentive funding programs include, but are not limited to, California's Carl Moyer Program, as set forth in Title 17, Part 5, Chapter 9 of the California Health and Safety Code, and the U.S. Department of Agriculture's Environmental Quality Incentives (EQIP) Program, as set forth in Title 7, Chapter XIV, Part 1466 of the Code of Federal Regulations.

(3) <u>Emission Standards for New Stationary Diesel-Fueled CI Engines, Less Than or Equal to 50 Brake Horsepower (< 50 bhp).</u>

As of January 1, 2005, except as provided in subsection (c), no person shall sell, offer for sale, or lease for use in California any stationary diesel-fueled CI engine that has a rated brake horsepower less than or equal to 50, unless the engine meets the current Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423) for PM, NMHC+NOx, and CO for off-road engines of the same horsepower rating (These requirements are summarized in Table 6.)

| TABLE 6 : SUMMARY OF THE EMISSION STANDARDS FOR STATIONARY DIESEL-FUELED CI ENGINES $\leq$ 50 BHP (SEE SUBSECTION (e)(3)) |
|---|
| DIESEL PM STANDARDS, NMHC+NOX, AND CO STANDARDS (g/bhp-hr) |
| Current Off-Road CI Engine Certification Standard for an off-road engine of the same model year and horsepower rating. |

(4) Recordkeeping , Reporting, and Monitoring Requirements

(A) Reporting Requirements for Owners or Operators of New and In-Use Stationary CI Engines, Including Non-Diesel-Fueled CI Engines, Having a Rated Horsepower Greater than 50 (> 50 bhp)

1. Except as provided in subsection (c) and subsection (e)(4)(A)5. below, prior to the installation of any new stationary CI engine (> 50 bhp) at a facility, each owner or operator shall provide the information identified in subsection (e)(4)(A)3. to the District APCO.

2. Except as provided in subsection (c) and subsection (e)(4)(A)5. below, and no later than July 1, 2005, each owner or operator of an in-use stationary CI engine (> 50 bhp) shall provide the information specified in subsection (e)(4)(A)3. to the District APCO.

3. Each owner or operator shall submit to the District APCO the following information for each new and in-use stationary CI engine (>50 bhp) in accordance with the requirements of subsections (e)(4)(A)1. and (e)(4)(A)2. above:

   a. Owner/Operator Contact Information
      I. Company name
      II. Contact name, phone number, address, e-mail address
      III. Address of engine(s)

b. Engine Information
   I. Make
   II. Model
   III. Engine Family
   IV. Serial number
   V. Year of manufacture (if unable to determine, approximate age)
   VI. Rated Brake Horsepower Rating
   VII. Exhaust stack height from ground
   VIII. Engine Emission Factors and supporting data for PM, NOx and NMHC separately or NMHC+NOx, and CO, (if available) from manufacturers data, source tests, or other sources (specify)

   IX. Control equipment (if applicable)
      i. Turbocharger
      ii. Aftercooler
      iii. Injection Timing Retard
      iv. Catalyst
      v. Diesel Particulate Filter
      vi. Other

c. Fuel(s) Used
   I. CARB Diesel
   II. Jet fuel
   III. Diesel
   IV. Alternative diesel fuel (specify)
   V. Alternative fuel (specify)
   VI. Combination (Dual fuel) (specify)
   VII. Other (specify)

d. Operation Information
   I. Describe general use of engine
   II. Typical load (percent of maximum bhp rating)
   III. Typical annual hours of operation
   IV. If seasonal, months of year operated and typical hours per month operated
   V. Fuel usage rate (if available)

e. Distance to nearest offsite receptor location

f. State whether the engine is included in an existing AB2588 emission inventory

4. Except as provided in subsection (c), and no later than 180 days prior to the earliest applicable compliance date specified in subsections (f)

or (g), each owner or operator of an in-use stationary diesel-fueled CI engine (> 50 bhp) shall provide the following additional information to the District APCO:

a. an identification of the control strategy for each stationary diesel-fueled CI engine that when implemented will result in compliance with subsections (e)(2). If applicable, the information should include the Executive Order number issued by the Executive Officer for a Diesel Emission Control Strategy that has been approved by the Executive Officer through the Verification Procedure.

5. The District APCO may exempt the owner or operator from providing all or part of the information identified in subsection (e)(4)(A)3. or (e)(4)(A)4. if there is a current record of the information in the owner or operator's permit to operate.

6. Upon the written request by the Executive Officer, the District APCO shall provide to the Executive Officer a written report of all information identified in subsections (e)(4)(A)3. and (e)(4)(A)4.

(B) Reporting Requirements for Sellers of New Emergency Standby or Stationary Prime Diesel-Fueled CI Engines (> 50 bhp) Sold To Agricultural Operations

1. Except as provided by subsection (c), by January 1, 2006 and January 1st of each year thereafter, any person who sells a stationary diesel-fueled CI engine having a rated brake horsepower greater than 50 for use in an agricultural operation shall provide the following information to the Executive Officer of the Air Resources Board:

a. Contact Information
   I. Seller's Company Name (if applicable);
   II. Contact name, phone number, e-mail address.

b. Engine Sales Information (for each engine sold for use in California in the previous 12 month calendar period).
   I. Make,
   II. Mode,
   III. Model year (if known),
   IV. Rated brake horsepower,
   V. Number of engines sold,
   VI. Certification executive order number (if applicable),
   VII. Engine family number (if known),
   VIII. Emission control strategy (if applicable).

(C) Reporting Requirements for Sellers of Stationary Diesel-Fueled CI Engines Having a Rated Brake Horsepower Less Than or Equal to 50 ($\leq$ 50 bhp)

1. Except as provided in subsection (c), by January 1, 2006 and January 1st of each year thereafter, all sellers of stationary diesel-fueled CI engines for use in California that have a rated brake horsepower less than or equal to 50 shall provide the following information to the Executive Officer of the Air Resources Board:

   a. Contact Information
      I. Sellers Company Name (if applicable);
      II. Contact name, phone number, e-mail address.

   b. Engine Sales Information (for each engine sold for use in California in the previous 12 month calendar period)
      I. Make,
      II. Model,
      III. Model year (if known),
      IV. Rated brake horsepower,
      V. Number of engines sold,
      VI. Certification executive order number (if applicable),
      VII. Engine family number (if known),
      VIII. Emission control strategy (if applicable).

(D) Demonstration of Compliance with Emission Limits

1. Prior to the installation of a new stationary diesel-fueled CI engine at a facility, the owner or operator of the new stationary diesel-fueled CI engine(s) subject to the requirements of section (e)(2)(A)3. or (e)(2)(C)1. shall provide emission data to the District APCO in accordance with the requirements of subsection (h) for purposes of demonstrating compliance.

2. By no later than the earliest applicable compliance date specified in subsections (f) or (g), the owner or operator of an in-use stationary diesel-fueled CI engine(s) subject to the requirements of subsection (e)(2)(B)3. or (e)(2)(D)1. shall provide emissions and/or operational data to the District APCO in accordance with the requirements of subsection (h) for purposes of demonstrating compliance.

(E) Notification of Non-Compliance

Owners or operators who have determined that they are operating their stationary diesel-fueled engine(s) in violation of the requirements specified in subsections (e)(2) shall notify the district APCO immediately upon detection of the violation and shall be subject to district enforcement action.

(F) Notification of Loss of Exemption

1. Owners or operators of in-use stationary diesel-fueled CI engines, who are subject to an exemption specified in section (c) from all or part of the requirements of subsection (e)(2), shall notify the district APCO immediately after they become aware that the exemption no longer applies. No later than 180 days after notifying the APCO, the owner or operator shall demonstrate compliance with the requirements of subsection (e)(2). An owner or operator of an in-use stationary diesel-fueled CI engine(s) subject to the requirements of subsection (e)(2) shall provide emission data to the District APCO in accordance with the requirements of subsection (h) for purposes of demonstrating compliance.

2. The District APCO shall notify owners or operators of in-use stationary diesel-fueled CI engines, who are subject to the exemption specified in subsection (c)(9) from the requirements of subsections(e)(1) and (e)(2), when the exemption no longer applies. No later than 180 days after notification by the District APCO, the owner or operator shall demonstrate compliance with the requirements of subsections (e)(1) and (e)(2). An owner or operator of an in-use stationary diesel-fueled CI engine(s) subject to the requirements of subsection (e)(2) shall provide emissions data to the District APCO in accordance with the requirements of subsection (h) for purposes of demonstrating compliance.

(G) Monitoring Equipment

1. A non-resettable hour meter with a minimum display capability of 9,999 hours shall be installed on all engines subject to all or part of the requirements of subsection (e)(2).

2. All DPFs installed pursuant to the requirements in subsection (e)(2) must be installed with a backpressure monitor to notify the owner or operator when the high backpressure limit of the engine is approached.

3. Consistent with section 39666(d) of the Health and Safety Code, the District APCO may require the owner or operator to install and maintain additional monitoring equipment for the particular emission control strategy(ies) used to meet the requirements of subsection (e)(2).

(H) Reporting Provisions for Exempted Prime Engines

An owner or operator of an engine subject to subsections (c)(6), (c)(11), or (c)(12) shall keep records of the number of hours the engines are operated on a monthly basis. Such records shall be retained for a minimum of 36 months from the date of entry. Record entries made within 24 months of the most recent entry shall be retained on-site, either at a central location or at the engine's location, and made immediately available to the District staff upon request. Record entries made from 25 to 36 months from the most recent entry shall be made available to District staff within 5 working days from the district's request.

(I) Reporting Requirements for Emergency Standby Engines

1. Starting January 1, 2005, each owner or operator of an emergency standby diesel-fueled CI engine shall keep a monthly log of usage that shall indicate the following:

   a. emergency use hours of operation;
   b. maintenance and testing hours of operation;
   c. hours of operation for emission testing to show compliance with subsections (e)(2)(A)3. and (e)(2)(B)3.;
   d. initial start-up hours; and
   e. hours of operation for all uses other than those specified in subsections (e)(4)(I)1.a through (e)(4)(I)1.d. above.

2. Log entries shall be retained for a minimum of 36 months from the date of entry. Log entries made within 24 months of the most recent entry shall be retained on-site, either at a central location or at the engine's location, and made immediately available to the District staff upon request. Log entries made from 25 to 36 months from most recent entry shall be made available to District staff within 5 working days from request.

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

**(f) Compliance Schedule for Owners or Operators of Three or Less Engines**

(1) Each in-use stationary diesel-fueled CI engine (> 50 bhp), which will meet the requirements of subsections (e)(2)(B) solely by maintaining or reducing the current annual hours of operation for maintenance and testing, shall be in compliance by no later than January 1, 2006.

(2) Each in-use stationary diesel-fueled CI engine (> 50 bhp), which is not subject to subsection (f)(1) but is required to meet the requirements of subsections (e)(2)(B) or (e)(2)(D), shall meet these requirements in accordance with the following schedule:

(A) All pre-1989 through 1989 model year engines, inclusive, shall be in compliance by no later than January 1, 2006;

(B) All 1990 through 1995 model year engines, inclusive, shall be in compliance by no later than January 1, 2007;

(C) All 1996 through 2007 model year engines, inclusive, shall be in compliance by no later than January 1, 2008; and

(D) All post-2007 model year engines shall comply with the requirements of this section applicable to their model years.

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

**(g) Compliance Schedule for Owners or Operators of Four or More Engines**

(1) Each in-use stationary diesel-fueled CI engine (> 50 bhp), which will meet the requirements of subsections (e)(2)(B) solely by maintaining or reducing the current annual hours of operation for maintenance and testing, shall be in compliance by no later than January 1, 2006.

(2) Engines under common ownership or operation, that are subject to the requirements of subsections (e)(2)(B) or (e)(2)(D) and that are not required to meet the compliance date specified in (g)(1), shall comply with (e)(2)(B) or (e)(2)(D), whichever applies, according to the following schedule:

Pre-1989 Through 1989 Model Year Engines, Inclusive

| Percent of Engines | Compliance date |
|---|---|
| 25% | January 1, 2006 |
| 50% | January 1, 2007 |
| 75% | January 1, 2008 |
| 100% | January 1, 2009 |

1990 through 1995 Model Year Engines, Inclusive

| Percent of Engines | Compliance date |
|---|---|
| 30% | January 1, 2007 |
| 60% | January 1, 2008 |
| 100% | January 1, 2009 |

| 1996 and Later Model Year Engines | |
|---|---|
| Percent of Engines | Compliance date |
| 50% | January 1, 2008 |
| 100% | January 1, 2009 |

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

**(h) Emissions Data**

(1) Upon approval by the District APCO, the following sources of data may be used in whole or part to meet the emission data requirements of subsections (e)(2)(A) through (e)(2)(D):

(A) off-road engine certification test data for the stationary diesel-fueled CI engine,
(B) engine manufacturer test data,
(C) emissions test data from a similar engine, or
(D) emissions test data used in meeting the requirements of the Verification Procedure for the emission control strategy implemented.

(2) Emissions testing of a stationary diesel-fueled CI engine, for purposes of showing compliance with the requirements of subsections (e)(2)(A) through (e)(2)(D), shall be done in accordance with the methods specified in subsection (i).

(3) For purposes of emissions testing, the particulate matter (PM) emissions from a dual-fueled stationary CI engine, which uses as its fuel a mixture of diesel fuel and other fuel(s), shall be deemed to be 100% diesel PM.

(4) Emissions testing for the purposes of determining the percent change from baseline shall include baseline and emission control strategy testing subject to the following conditions:

(A) Baseline testing may be conducted with the emission control strategy in place, provided the test sample is taken upstream of the emission control strategy and the presence of the emission control strategy is shown to the District APCO's satisfaction as having no influence on the emission test results;

(B) Control strategy testing shall be performed on the stationary diesel-fueled CI engine with full implementation of the emission control strategy;

(C) The percent change from baseline shall be calculated as the baseline emissions minus control strategy emissions, with the difference being divided by the baseline emissions and the result expressed as a percentage; and

(D) The same test method shall be used for determining both baseline emissions and control strategy emissions.

(5) Emission testing for the purposes of demonstrating compliance with an emission level shall be performed on the stationary diesel-fueled CI engine with the emission control strategy fully implemented.

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

**(i) Test Methods**

(1) The following test methods shall be used to determine diesel PM, HC, NOx, CO and NMHC emission rates:

(A) Diesel PM emission testing shall be done in accordance with one of the following methods:

1. California Air Resources Board Method 5 (ARB Method 5), *Determination of Particulate Matter Emissions from Stationary Sources*, as amended July 28, 1997, which is incorporated herein by reference.

a. For purposes of this subsection, diesel PM shall be measured only by the probe catch and filter catch and shall not include PM captured in the impinger catch or solvent extract.

b. The tests are to be carried out under steady state operation. Test cycles and loads shall be in accordance with ISO-8178 Part 4 or alternative test cycle approved by the District APCO.

c. The District APCO may require additional engine or operational duty cycle data if an alternative test cycle is requested; or

2. International Organization for Standardization (ISO) 8178 Test procedures: ISO 8178-1:1996(E) ("ISO 8178 Part 1"); ISO 8178-2: 1996(E) ("ISO 8178 Part 2"); and ISO 8178-4: 1996(E) ("ISO 8178 Part 4"), which are incorporated herein by reference; or

3. Title 13, California Code of Regulations, section 2423, *Exhaust Emission Standards and Test Procedures –Off-Road Compression Ignition Engines*, which is incorporated herein by reference.

(B) NOx, CO and HC emission testing shall be done in accordance with one of the following methods:

1. California Air Resources Board Method 100 (ARB Method 100), *Procedures for Continuous Gaseous Emission Stack Sampling*, as amended July 28, 1997, which is incorporated herein by reference.

   a. Tests using ARB Method 100 shall be carried out under steady state operation. Test cycles and loads shall be in accordance with ISO-8178 Part 4 or alternative test cycle approved by the District APCO.

   b. The District APCO may require additional engine or operational duty cycle data if an alternative test cycle is requested; or

2. International Organization for Standardization (ISO) 8178 Test procedures: ISO 8178-1:1996(E) ("ISO 8178 Part 1"); ISO 8178-2: 1996(E) ("ISO 8178 Part 2"); and ISO 8178-4: 1996(E) ("ISO 8178 Part 4"), which are incorporated herein by reference; or

3. Title 13, California Code of Regulations, section 2423, *Exhaust Emission Standards and Test Procedures – Off-Road Compression Ignition Engines*, which is incorporated herein by reference.

(C) NMHC emission testing shall be done in accordance with one of the following methods:

1. International Organization for Standardization (ISO) 8178 Test procedures: ISO 8178-1:1996(E) ("ISO 8178 Part 1"); ISO 8178-2: 1996(E) ("ISO 8178 Part 2"); and ISO 8178-4: 1996(E) ("ISO 8178 Part 4"), which are incorporated herein by reference; or
2. Title 13, California Code of Regulations, section 2423, *Exhaust Emission Standards and Test Procedures –Off-Road Compression Ignition Engines*, which is incorporated herein by reference.

(2) Consistent with section 39666(d) of the Health and Safety Code, the District APCO may approve the use of alternatives to the test methods listed in subsection (i)(1), provided the alternatives are demonstrated to the APCO's satisfaction as accurate in determining the emission rate of diesel PM, HC, NOx, NMHC, or CO.

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

# Appendix B

## Stationary Emergency/Standby Diesel-Fueled Engine Survey

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Tables and Figures

## I. Introduction and Background

In September 2002, the Air Resources Board (ARB or Board) conducted the Stationary Emergency/Standby Diesel-Fueled Engine Survey (survey or ES Survey). The intent of the survey was to obtain a representative sampling of the average number of hours that stationary emergency/standby diesel-fueled engines were operated in California for the purposes of maintenance and testing, interruptable service contracts (ISCs), and emergencies. The information gathered would enable us to determine how many engines would potentially be affected by the proposed airborne toxic control measures (ATCMs) for stationary compression-ignition engines and would also aid in enhancing our statewide inventory of stationary diesel-fueled engines.

Using contact information obtained from the local air quality management and air pollution control districts' (districts) permit data and the California Energy Commission's list of back-up generators, the survey was distributed to approximately 3,000 private companies and facilities and public entities, including county, city, state, and federal agencies throughout California. Surveys included a requested due date of September 30, 2002, or October 11, 2002 (survey recipients in the San Joaquin Valley received their package two weeks later, and therefore, were alloted more time). The survey was also available on the ARB web site and an e-mail notice was sent to the approximately 750 subscribers of the stationary diesel risk reduction e-mailing list. A copy of the cover letter and the actual survey can be found in Section IV of this Appendix.

More than 800 surveys were returned with data for approximately 3,200 engines, while 69 surveys were returned from facilities stating they do not currently have stationary emergency/standby diesel-fueled engines. The majority of the surveys that contained an explanation cited changes in facility operation as the reason for the change in engine status.

The stationary emergency/standby diesel-fueled engine survey requested engine owners/operators to submit the following information for each applicable engine:

- engine make (manufacturer)
- model
- horsepower rating
- model year
- approximate age (if model year unknown)
- actual annual hours of operation for 1999 through 2001 for each purpose:
  - maintenance and testing
  - interruptable service contract
  - emergencies

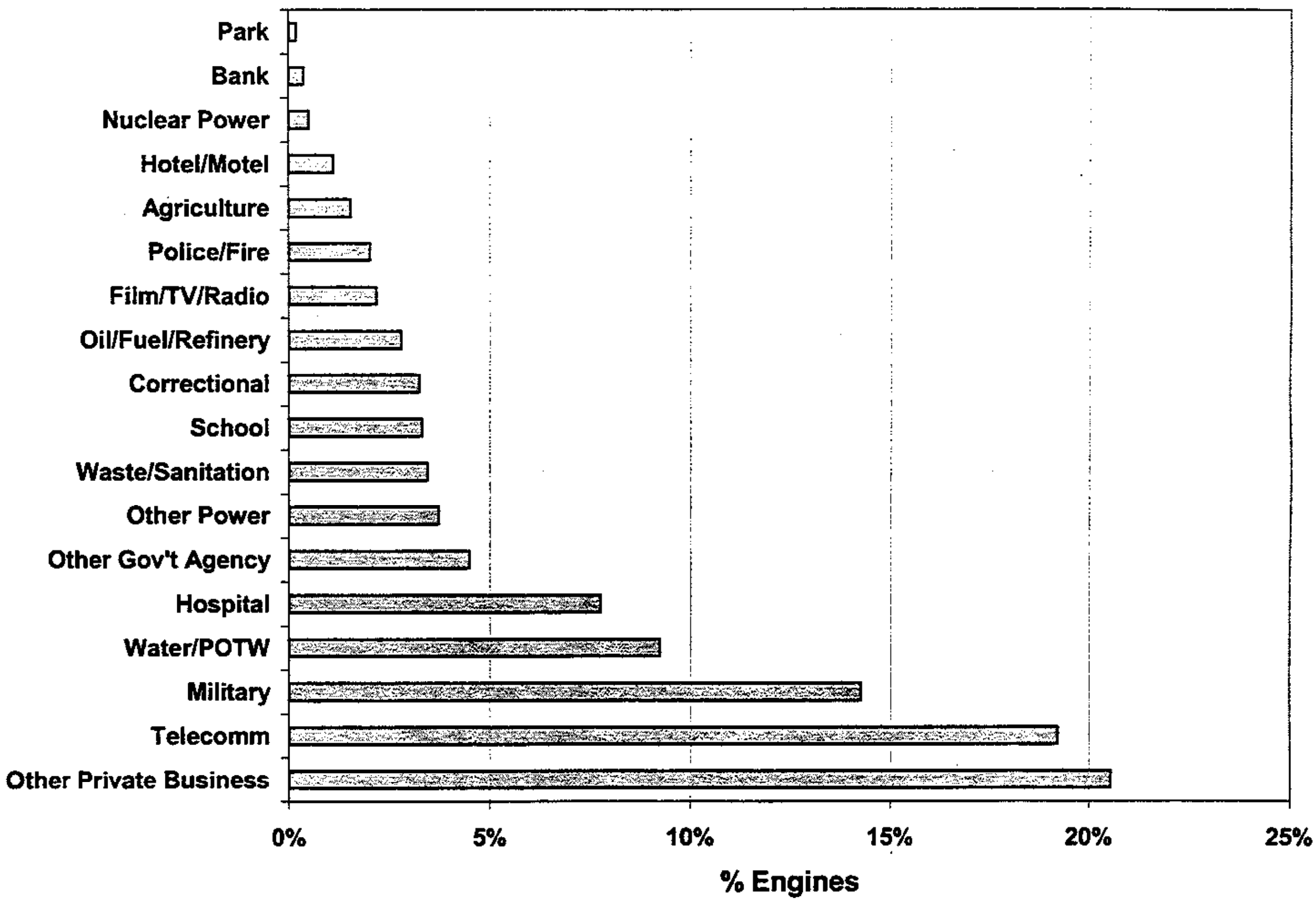
In requesting the survey, the ARB stated that specific survey responses or the names of businesses would not be published but that the data from the survey would be analyzed and discussed in public workshops and reports. A brief summary of staff's initial survey analysis was presented at a public workshop in November 2002.

The 3,200 engines included in the returned surveys represent approximately 17 percent of the current estimated stationary emergency/standby diesel-fueled engine statewide inventory. Information regarding the statewide inventory can be found in Chapter IV.

## II. Survey Response

As stated in section I, the ES Survey was distributed to approximately 3,000 private and public entities. Figure B-1 below shows the types of facilities that responded to the survey and their corresponding response rates.

**Figure B-1: Facility Survey Responses**




The "Other Private Businesses" category in the chart above includes building property management companies, retail stores, and many other miscellaneous business types. The "Agriculture" category includes food growing and production facilities, wineries, and meat processing facilities. Of the total responses, 50 percent were from private companies/facilities, 42.5 percent were from public agencies (county, city, state, and federal), and 7.5 percent (248 engines) were undetermined. Of the 248 undetermined facility engines, 188, or 76 percent, were from hospitals. Since survey respondents supplied facility names only, staff were not always able to determine if the hospitals were public or private facilities.

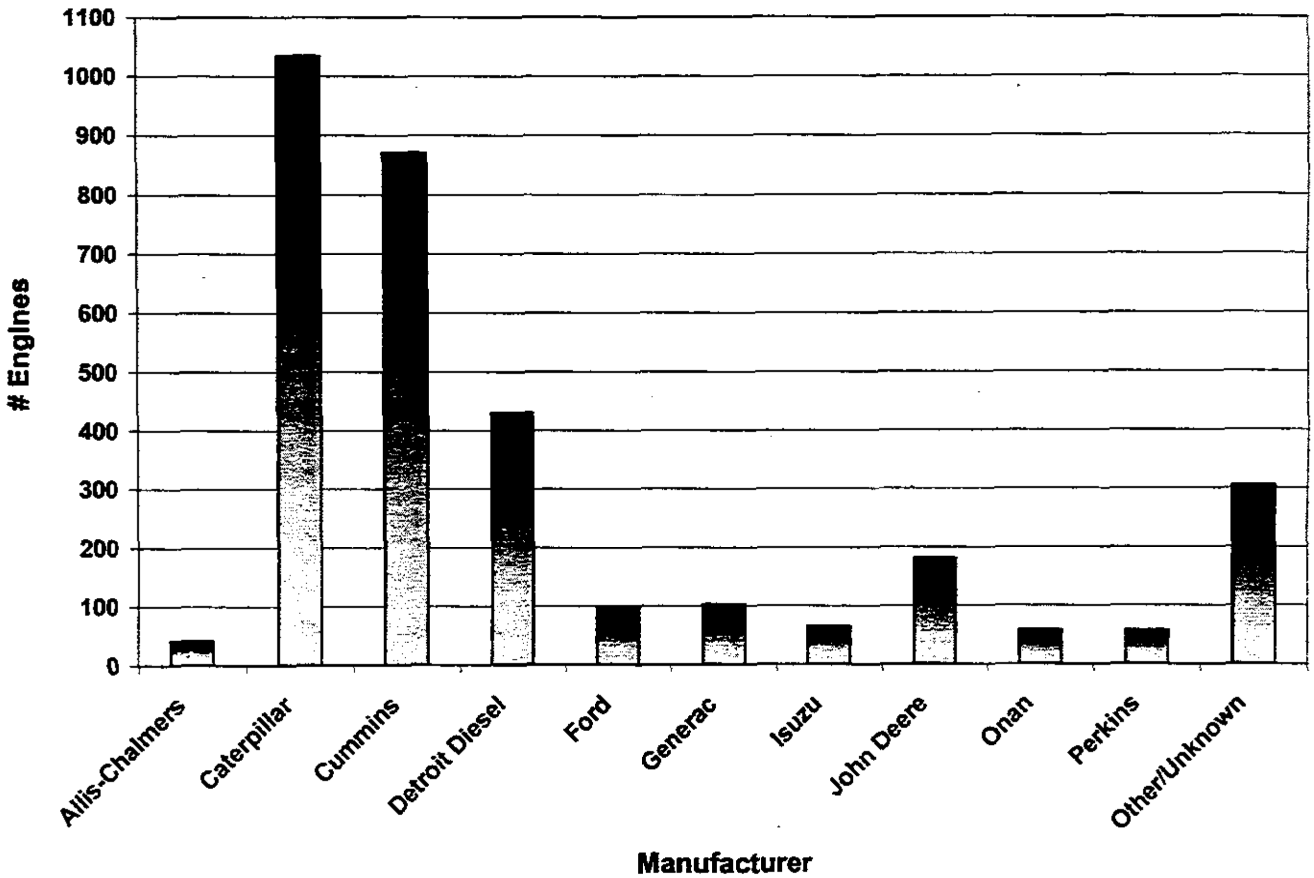
## III. Survey Results

The figures and tables in this section represent the results of the key data fields from the ES Survey. Not all records had data for every field, so null values were not included in averages or population numbers.

### A. Engine Manufacturers

As shown in Figure B-2 below, the most prominent engine manufacturers of stationary diesel-fueled engines from the ES Survey were Caterpillar and Cummins, comprising 32 and 27 percent of the engines, respectively. Included in the "Other/Unknown" category were manufacturers that represented less than 40 engines each, such as Waukesha, White, Kohler, General Motors, Hino, Mitsubishi, Volvo, Komatsu, to name a few. The "Other/Unknown" category comprised nine percent of the engines. It is also important to note that it is possible that some survey respondents included the name of the backup generator manufacturer as opposed to the engine manufacturer.

**Figure B-2: Engine Manufacturers**



## B. Horsepower and Model Year

Table B-1 shows the number of engines listed in specific horsepower ranges. The ranges correlate to those used in the stationary diesel-fueled engine statewide inventory. The largest number of the engines from the survey were within the 251 to 500 horsepower range, the average and median ratings were 604 and 360 horsepower, respectively. Our survey targeted engines greater than or equal to 50 horsepower, so while we received some data for the smaller engines, they were not included in the table at right or in the average or median horsepower ratings.

**Table B-1: Horsepower Ranges**

| HP Range | # Engines |
|---|---|
| 51-120 | 592 |
| 121-175 | 332 |
| 176-250 | 317 |
| 251-500 | 632 |
| 501-750 | 375 |
| 751-1000 | 222 |
| >1000 | 575 |
| *Total* | *3,045* |

Since the stationary diesel-fueled engine statewide inventory groups engines by both model year and horsepower, Tables B-2 and B-3 below show the survey engine population for the same horsepower ranges and model year ranges used in the inventory. Table B-2 displays the engines by model year while Table B-3 displays the engines by horsepower. There were 561 engines rated over 50 horsepower that did not have model year or age data, while only 101 engines had no horsepower data.

**Table B-2: Model Year and Horsepower Ranges (by Horsepower)**

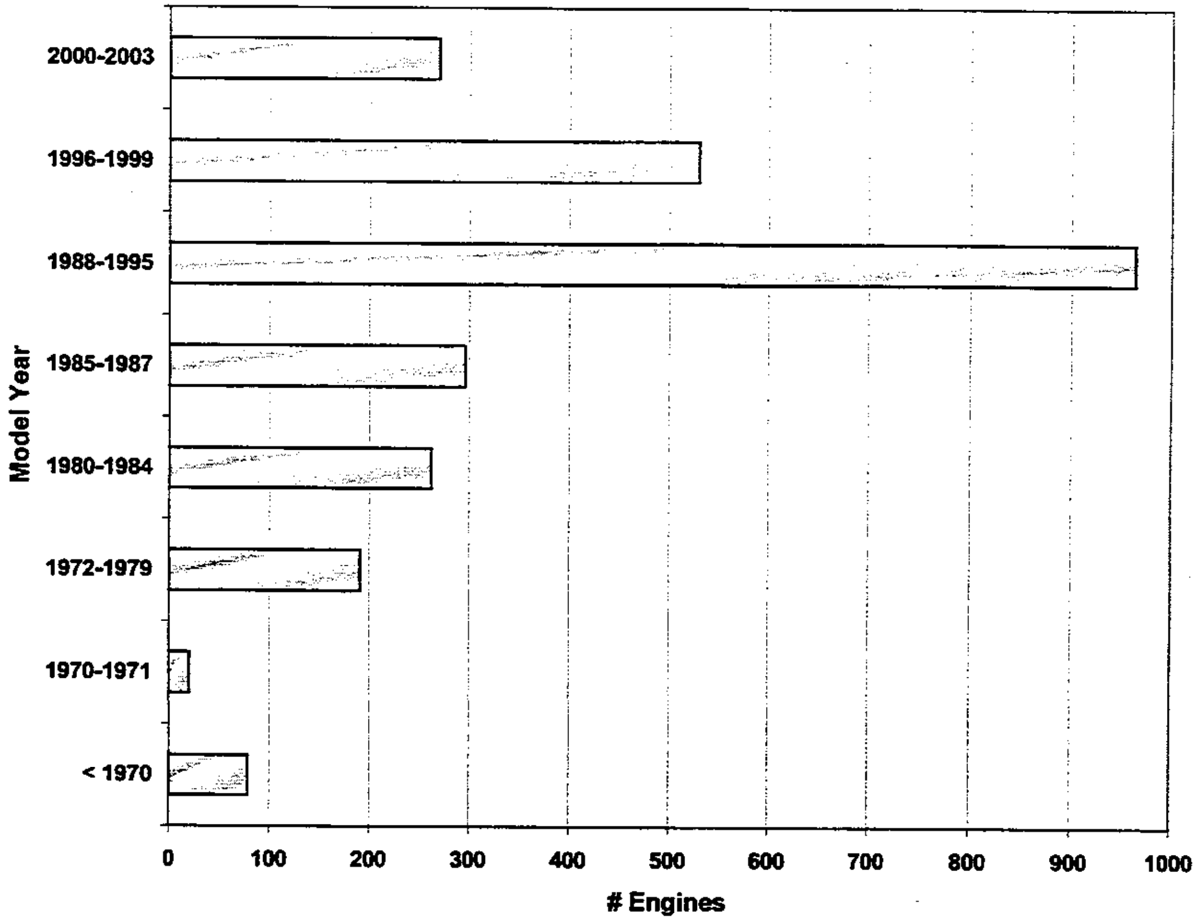
| Model Year Range | No HP Data | 51-120 | 121-175 | 176-250 | 251-500 | 501-750 | 751-1000 | >1000 |
|---|---|---|---|---|---|---|---|---|
| No Age Data | | 206 | 44 | 38 | 79 | 83 | 23 | 88 |
| < 1970 | 6 | 7 | 15 | 18 | 12 | 9 | 3 | 9 |
| 1970-1971 | 2 | 2 | - | - | 10 | - | 2 | 5 |
| 1972-1979 | 8 | 23 | 16 | 23 | 36 | 32 | 15 | 34 |
| 1980-1984 | 12 | 34 | 29 | 27 | 57 | 35 | 28 | 39 |
| 1985-1987 | 10 | 50 | 35 | 37 | 88 | 30 | 24 | 22 |
| 1988-1995 | 29 | 162 | 111 | 99 | 204 | 108 | 63 | 177 |
| 1996-1999 | 20 | 72 | 53 | 52 | 100 | 48 | 40 | 137 |
| 2000-2003 | 14 | 36 | 29 | 23 | 46 | 30 | 24 | 64 |

**Table B-3: Model Year and Horsepower Ranges (by Model Year)**

| HP Range | No Age Data | < 1970 | 1970-1971 | 1972-1979 | 1980-1984 | 1985-1987 | 1988-1995 | 1996-1999 | 2000-2003 |
|---|---|---|---|---|---|---|---|---|---|
| No HP Data | | 6 | 2 | 8 | 12 | 10 | 29 | 20 | 14 |
| 51-120 | 206 | 7 | 2 | 23 | 34 | 50 | 162 | 72 | 36 |
| 121-175 | 44 | 15 | - | 16 | 29 | 35 | 111 | 53 | 29 |
| 176-250 | 38 | 18 | - | 23 | 27 | 37 | 99 | 52 | 23 |
| 251-500 | 79 | 12 | 10 | 36 | 57 | 88 | 204 | 100 | 46 |
| 501-750 | 83 | 9 | - | 32 | 35 | 30 | 108 | 48 | 30 |
| 751-1000 | 23 | 3 | 2 | 15 | 28 | 24 | 63 | 40 | 24 |
| >1000 | 88 | 9 | 5 | 34 | 39 | 22 | 177 | 137 | 64 |

Figure B-3 below shows the number of engines in each model year range. The average engine age was 12 years and the median age was 10 years.

**Figure B-3: Engine Distribution by Model Year**




As shown in the figure above, the largest model year group was 1988-1995, making up 37 percent of all of engines for which age or model year data was received.

## C. Hours of Operation

The ES Survey requested actual hours of operation for three calendar years (1999 through 2001) for each of the following purposes: maintenance and testing, interruptable service contracts (ISC), and emergencies. Hours of operation data was received for 3,038 engines and the averages are presented in Table B-4. The data shows that stationary emergency/standby diesel-fueled engines operate approximately 31 hours per year on

**Table B-4: Average Hours of Operation**

| | Year | | |
|---|---|---|---|
| **Activity** | **1999** | **2000** | **2001** |
| **Maintenance & Testing** | 22 | 22 | 21 |
| **Interruptable Service Contract*** | 1 | 3 | 4 |
| **Emergency/Standby** | 6 | 6 | 8 |
| **Total** | 29 | 31 | 33 |
| **Avg. Total** | 31 | | |

* Includes all engines that reported hours of operation data for any purpose.

average. The majority of those hours (approximately 77 percent) are for maintenance and testing, while only about 20 percent of the annual hours are for actual emergency operation.

**Table B-5: Reported ISC Hours**

| | Year | | |
|---|---|---|---|
| | 1999 | 2000 | 2001 |
| # Engines | 77 | 165 | 198 |
| Total # Engines** | 236 | | |
| Max Hours | 543.6 | 2160.8 | 210 |
| Average Hours | 8.06 | 27.79 | 39.77 |
| Overall Average | 25.82 | | |

** The total number of engines that reported ISC hours during at least one of the years (1999-2001).

For ISCs, the averages given are for all engines that have reported hours of operation. Since there are very few engines that indicated any hours of operation for an ISC program (about 8 percent), the average hours for ISC in Table B-4 are low. Table B-5 shows the data for engines that specifically reported ISC hours. As the table indicates, there was an increase in the number of ISC hours for each year. The increase from 1999 to 2000 was 245 percent and from 2000 to 2001, the increase was 43 percent. However, not all engines experienced an increase from one calendar year to the next (see Table B-6).

**Table B-6: Increase in ISC Hours**

| | Engines with Increase in Hours | |
|---|---|---|
| Year | # | % |
| 1999 to 2000 | 131 | 56% |
| 2000 to 2001 | 147 | 62% |
| 1999 to 2001 | 164 | 69% |

While an emergency/standby engine's primary purpose is to provide service in the event of an emergency, such situations generally do not arise often, so the average annual hours of emergency operation are low. Table B-7 shows the number of engines that reported emergency/standby hours of operation and the average annual hours. Over the three-year period, the average annual operation for emergency/standby purposes was 7 hours.

**Table B-7: Emergency/Standby Hours**

| Year | # Engines | % Engines | Average Hours |
|---|---|---|---|
| 1999 | 998 | 33% | 5.84 |
| 2000 | 1091 | 36% | 6.45 |
| 2001 | 1251 | 41% | 8.44 |

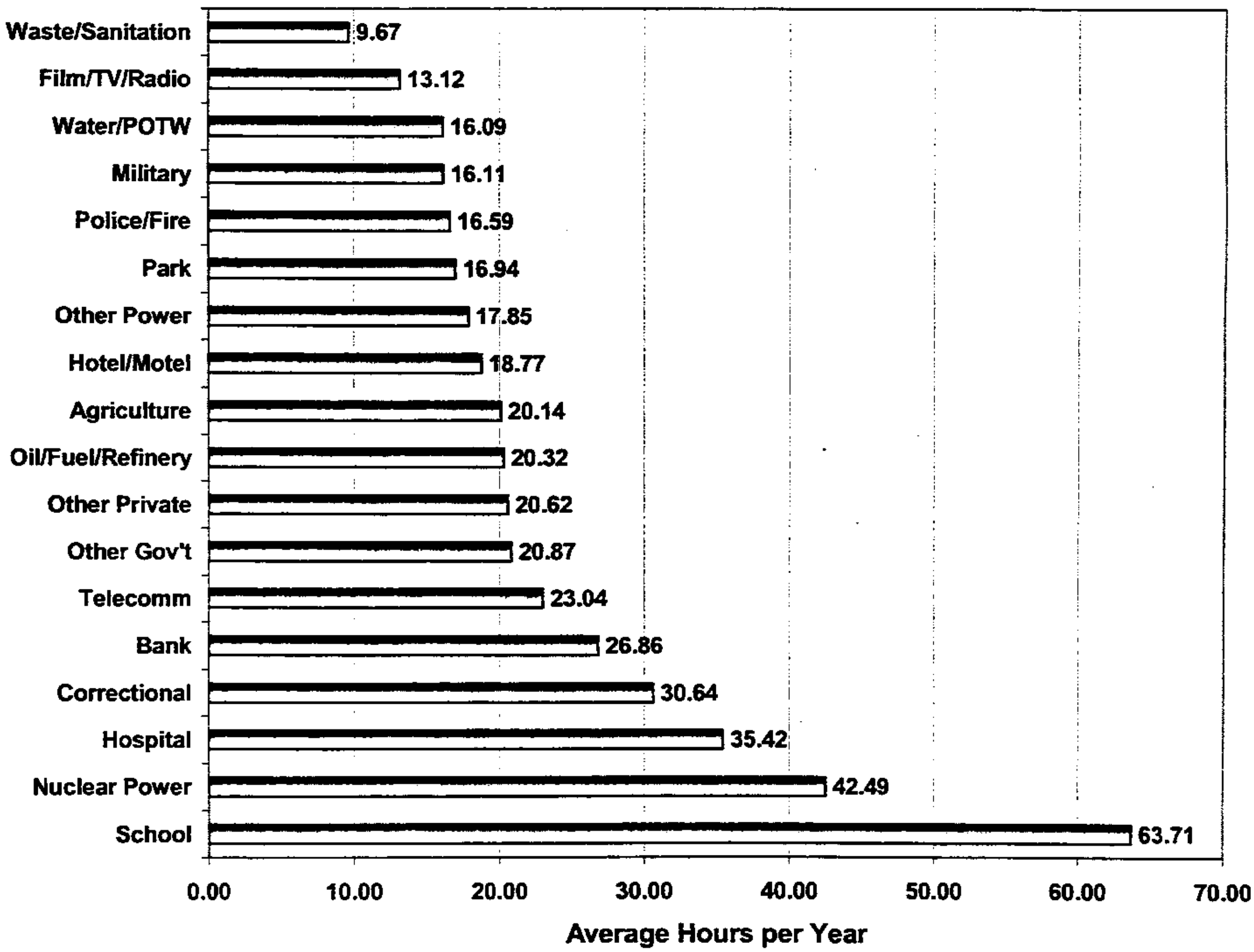
Although maintenance and testing hours comprise 77 percent of the average annual emergency/standby engine use, 95 percent of the engines run for 50 hours per year or less on average for that purpose. Table B-8 shows the percentages for 10, 20, 30, 40, and 50 hours per year.

### Table B-8: Maintenance and Testing Average Hours Per Year

| | Average Hours per Year | | | | |
|---|---|---|---|---|---|
| | ≤ 50 | ≤ 40 | ≤ 30 | ≤ 20 | ≤ 10 |
| # Engines | 2883 | 2880 | 2605 | 1632 | 927 |
| % Engines | 95% | 92% | 86% | 54% | 30.5% |

Depending on the type of facility, maintenance and testing hours can vary. The required amount of hours that emergency/standby engines are tested each year are usually mandated by either legislation and/or facility, company, or corporate policy. Figure B-4 indicates the three-year average annual maintenance and testing hours of operation for each facility type identified.

### Figure B-4: Average Annual Maintenance & Testing Hours by Facility Type



Engines operated by public agencies were run, on average, 21 hours per year for maintenance and testing, and private facilities had an average operation of 22 annual hours. For all engines included in the survey, the overall average maintenance and testing hours were 21.7 hours per year. It is important to note that the four facility types above that averaged more than 30 hours per year were schools, nuclear power plants, hospitals, and correctional facilities. Schools, which averaged almost 64 hours per year, comprised only three percent of the engines from the survey, nuclear power plants comprised one percent, hospitals comprised eight percent, and correctional facilities comprised eight percent, for a combined total of 15 percent.

# IV. Survey Package

'inston H. Hickox
ɟency Secretary

# Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman
1001 I Street • P.O. Box 2815 • Sacramento, California 95812 • www.arb.ca.gov

Gray Davis
Governor



September 10, 2002

Dear Madam/Sir:

**Air Resources Board Survey on Stationary Emergency/Stand-by Diesel-Fueled Engines**

We are writing to ask you to fill out the enclosed Air Resources Board (ARB) survey on stationary emergency/stand-by diesel-fueled engines. The short survey asks about the engines' make, model, age, and how many hours the engines were operated (actual hours of operation, not permitted hours) each year for the past three years. Below are answers to some questions you may have regarding the survey.

Why is the ARB requesting this information?

We are currently developing an airborne toxic control measure (ACTM) to control particulate matter emissions from stationary diesel-fueled engines. The survey responses will give us up-to-date information on annual hours of operation for emergency/stand-by engines. We will use the information to identify and evaluate the impacts of emission reduction strategies for emergency/stand-by engines.

Does the ARB have the legal authority to request the survey information?

Yes. State law authorizes the ARB to request and gather the information required to determine if measures are needed to protect the public health from toxic air contaminants.

What if my business/facility does not have any emergency/stand-by engines?

Simply include your business/facility contact information, check-mark the box at the top of the form, and return it to us.

What will the ARB do with my survey?

We will enter the information into a database for analysis. The results of this analysis may be discussed at future workshops and summarized in our technical documents. However, we will not publish your survey responses or the name of your business in our documents.

When does the ARB need my survey?

Please return your survey by September 30, 2002. You may either fax it to us at (916) 327-6251, or mail it to the following address:

California Air Resources Board
Attn: SSD/EAB
P.O. Box 2815
Sacramento, CA 95812-2815

Who should I contact if I have questions regarding the survey?

You may contact Mr. Alex Santos at (916) 327-5638 or via e-mail at asantos@arb.ca.gov, or Ms. Lisa Williams at (916) 327-1498 or via e-mail at lwilliam@arb.ca.gov.

We would like to thank you in advance for responding to this survey.

Sincerely,

/s/

Daniel E. Donohoue, Chief
Emissions Assessment Branch

Enclosure

cc: Mr. Alex Santos
Air Resources Engineer
Emissions Assessment Branch

Ms. Lisa Williams
Air Resources Technician
Emissions Assessment Branch

California Air Pollution Control Officers Association

Cal :nia Environmental Protection Agency

# Air Resources Board

Business/Facility Name: ______________________

Address: ______________________

City: ______________________ Zip: __________

Contact Name: ______________________ Phone: ( )

## Stationary Emergency/Stand-by Diesel-Fueled Engine Survey

☐ If your business/facility does not have any emergency/stand-by engines, please mark this box, fill in the contact information above, and return this form to us.

☐ If you are a "small business" (annual gross receipts of $10,000,000 or less per Cal. Gov. Code Sec. 14837(d)(1)), please mark this box.

**Instructions:**

1. Please fill in your contact information above.
2. Please limit your responses to stationary diesel-fueled emergency/stand-by engines only. An emergency/stand-by engine is any engine used only when normal power or natural gas service fails (i.e., back-up generators), for emergency purposes (i.e., fire pumps, water pumps for flood relief, etc.), or for participation in interruptable load programs (i.e., during periods of fuel or energy shortage in order to minimize or decrease the scale or duration of power outages).
3. Please only indicate the approximate age of the engine if you do not know the model year.
4. Please fax this survey to **(916) 327-6251**, or mail it to the address on the back of this form.

| Permit # (if permitted) | Engine Make | Engine Model | Horse-power | Model Year (if known) | Approx Age | Hours Operated Year **1999** | | | Hours Operated Year **2000** | | | Hours Operated Year **2001** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Maint / Testing | Emerg / Standby | Other* | Maint / Testing | Emerg / Standby | Other* | Maint / Testing | Emerg / Standby | Other* |
| *Example* | *Cummins* | *3451D* | | | | *142* | *84* | *26* | *105* | *96* | *0* | *200* | *173* | *15* |
| | | | | | | | | | | | | | | |
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* If engine were operated for the purpose of participating in interruptable load programs, please write "ILP" next to the number in this box.

*Printed on Recycled Paper*

# Appendix C

## Stationary Prime Diesel-Fueled Engine Survey

# TABLE OF CONTENTS

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Tables and Figures

## I. Introduction and Background

In March 2003, the Air Resources Board (ARB or Board) conducted the Stationary Prime Diesel-Fueled Engine Survey (survey or Prime Survey). The survey was again conducted in June 2003 for facilities/companies residing within the Bay Area Air Quality Management District. The intent of the survey was to obtain a representative sampling of how stationary prime diesel-fueled engines are operated in California and the applications for which they operated. The information gathered would enable us to determine how many engines would potentially be affected by the proposed airborne toxic control measure (ATCM) for stationary compression-ignition engines and would also aid in enhancing our statewide inventory of stationary diesel-fueled engines.

Using contact information obtained from the local air quality management and air pollution control districts' (districts) permit data, the survey was distributed to approximately 560 private companies and facilities and public entities, including county, city, state, and federal agencies throughout California. The Prime Surveys distributed in March included a requested due date of April 11, 2003, and those distributed in June requested a return date of June 30, 2003. The survey was also available on the ARB web site and an e-mail notice was sent to the approximately 750 subscribers of the stationary diesel risk reduction e-mailing list. A copy of the cover letter and the actual survey can be found in Section IV of this Appendix.

As of this writing, 59 Prime Surveys were returned with data for 171 diesel-fueled engines. Several surveys were received for engines that use natural gas as a fuel, and those were not included in our survey analysis.

The Prime Survey requested engine owners/operators to submit the following information for each applicable engine:

- engine location (address)
- engine make (manufacturer)
- model
- serial number
- model year
- rated horsepower
- control equipment (i.e., diesel particulate filter, oxidation catalyst, etc.)
- fuel type
- fuel usage rate (i.e., number of gallons per week, month, or year)
- application or general use
- typical load
- average total hours operated per year
- normal hours of operation

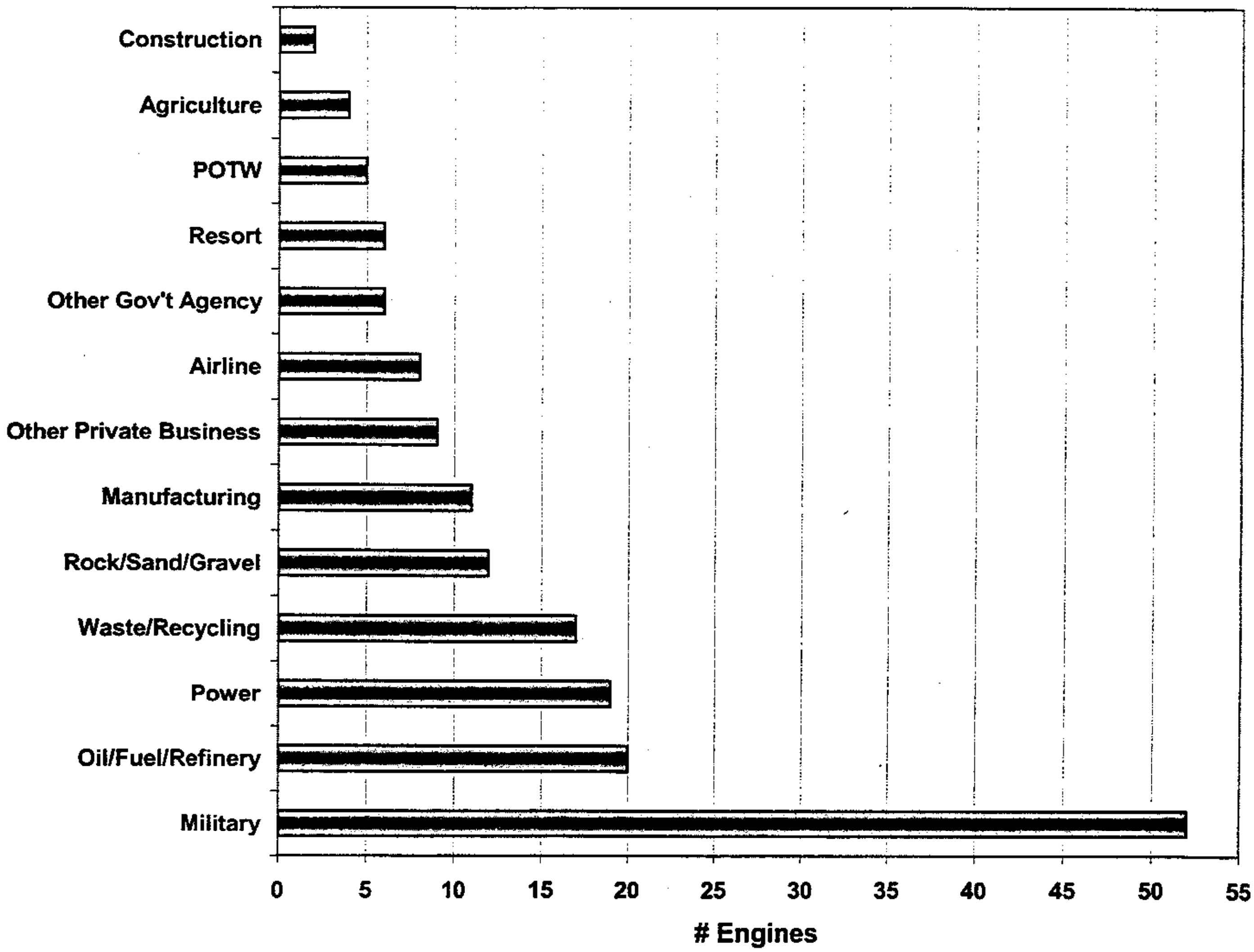
In requesting the survey, the ARB stated that specific survey responses or the names of businesses would not be published but that the data from the survey would be analyzed and discussed in public workshops and reports.

The 171 engines included in the returned surveys represent approximately __ percent of the current estimated stationary prime diesel-fueled engine statewide inventory. Information regarding the statewide inventory can be found in Chapter __.

## II. Survey Response

As stated in section I, the Prime Survey was distributed to 560 private and public facilities. Figure C-1 below shows the types of facilities that responded to the survey and their corresponding response rates.

**Figure C-1: Facility Survey Responses**




The "Waste/Recycling" category includes landfills and garbage collecting or sorting facilities as well as recycling centers. The "Other Private Businesses" includes auto wrecking facilities, shipping container facilities, and other miscellaneous business types. The "Agriculture" category includes food growing and production facilities, wineries, and meat processing facilities. Of the total responses, 63 percent were from private companies/facilities and 37 percent were from public agencies (county, city, state, and federal).

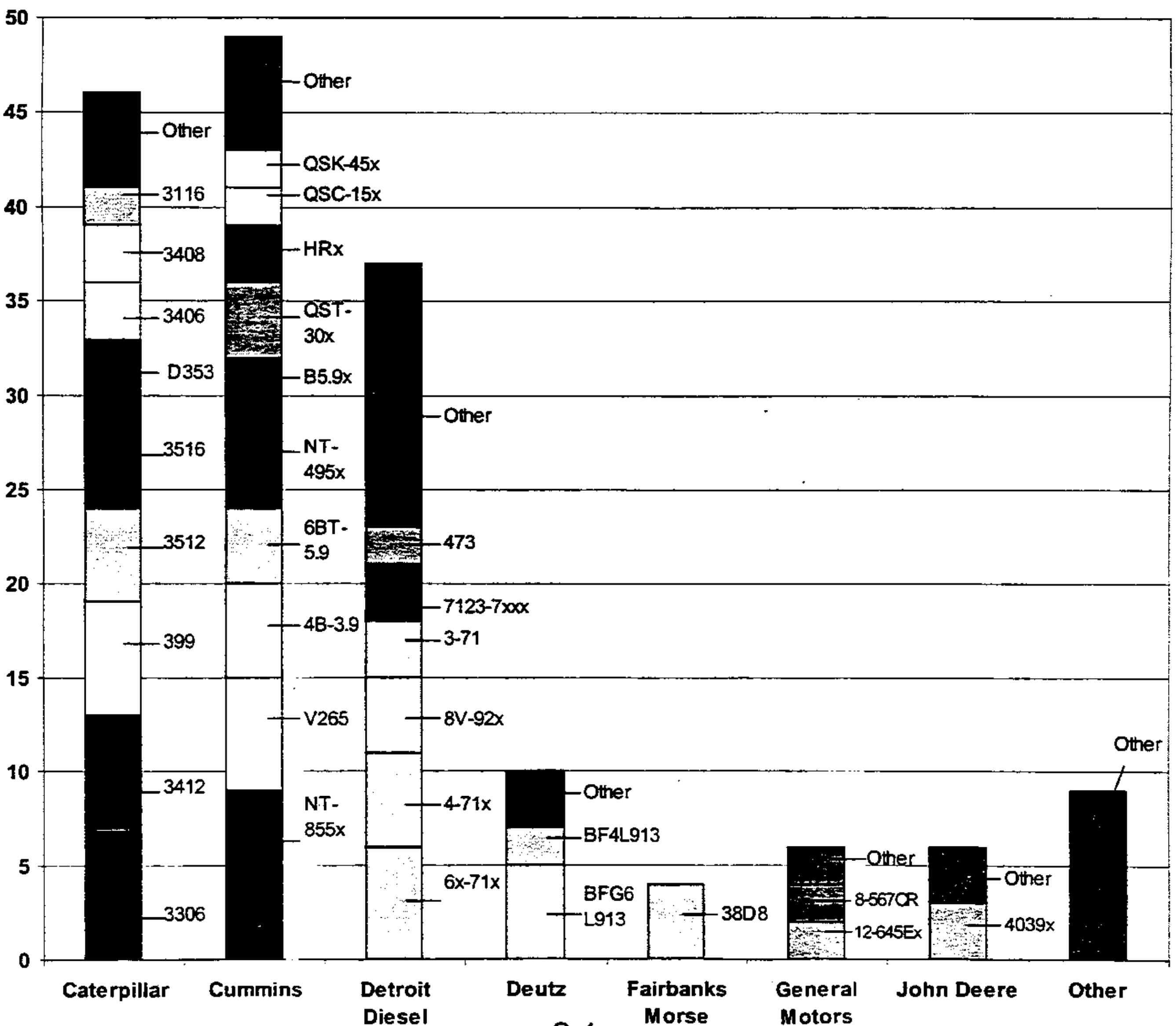
## III. Survey Results

The figures and tables in this section represent the results of the key data fields from the Prime Survey. Not all records had data for every field, so null values were not included in averages or population numbers.

### A. Engine Manufacturers

As shown in Figure C-2, the most prominent engine manufacturers of stationary diesel-fueled engines from the Prime Survey were Caterpillar, Cummins, and Detroit Diesel, totaling 77 percent of the engines. Engine models varied significantly and are also presented in the chart below. Included in the "Other/Unknown" category were manufacturers that represented fewer than 4 engines each, such as Case, Allis-Chalmers, Isuzu, and Perkins, to name a few. The "Other/Unknown" category comprised approximately eight percent of the engines.

**Figure C-2: Engine Manufacturers and Models**



## B. Applications and Location

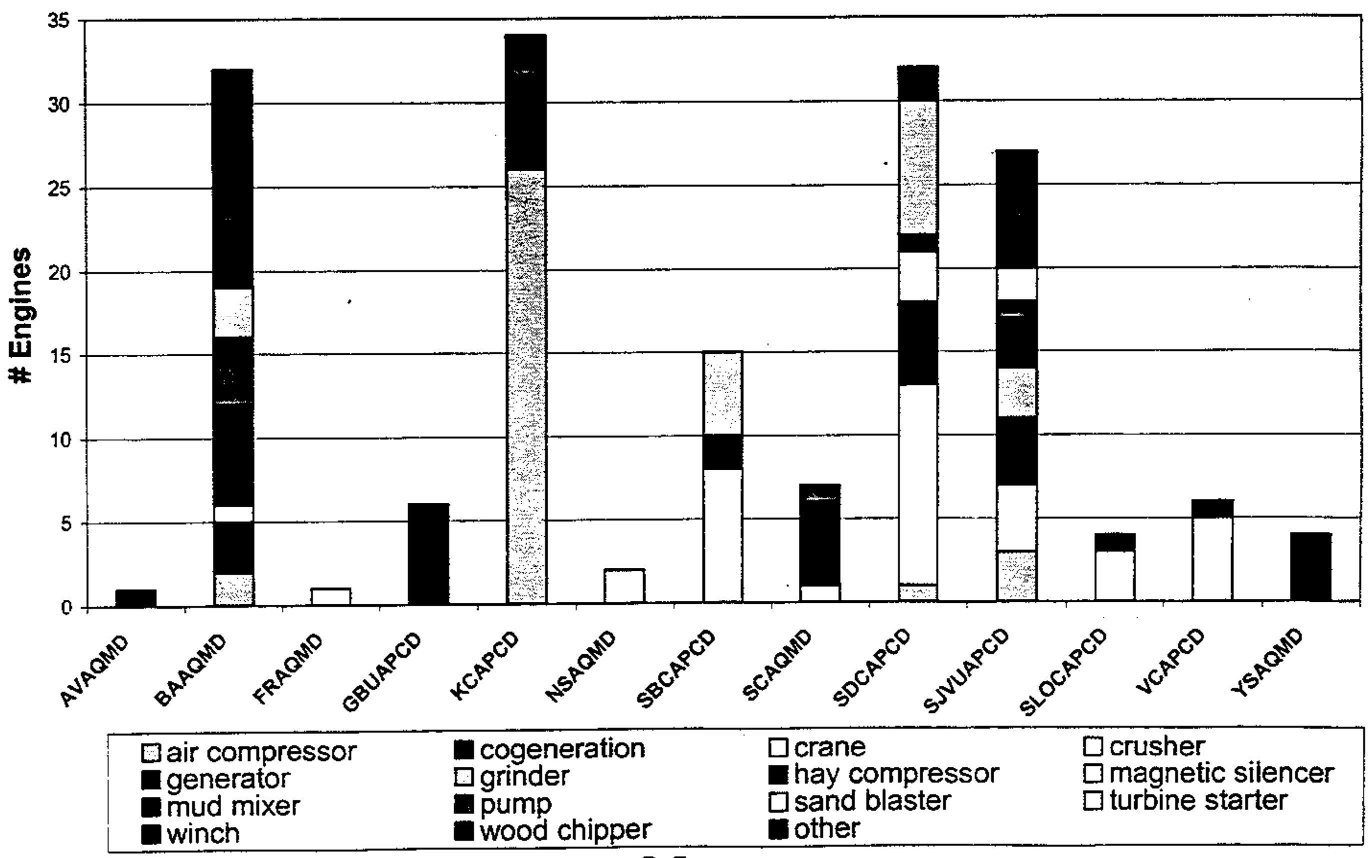
As shown in Figure C-2, the types of facilities that use stationary prime engines vary greatly. There are also a wide variety of applications for which prime engines are used. Table C-1 lists the number of engines in each application. Similar applications were sometimes grouped into a single category (i.e., rock crushers, concrete crushers, and jaw crushers were grouped under "crushers"). The "other" category includes single engine applications (such as blower, hydraulic pipe press, and lab knock engine, to name a few), that could not be easily grouped into specific categories.

Figure C-3 shows the applications as they are distributed throughout the districts. Not all districts are represented, since survey data was not received for engines in every district. Therefore, the chart below is not necessarily representative of the distribution of stationary prime engines throughout the State.

**Table C-1: Applications**

| HP Range | # Engines |
|---|---|
| air compressor | 6 |
| cogeneration | 3 |
| crane | 26 |
| crusher | 11 |
| generator | 56 |
| grinder | 3 |
| hay compressor | 4 |
| magnetic silencer | 3 |
| mud mixer | 3 |
| pump | 13 |
| sand blaster | 2 |
| turbine starter | 16 |
| winch | 3 |
| wood chipper | 7 |
| other | 15 |

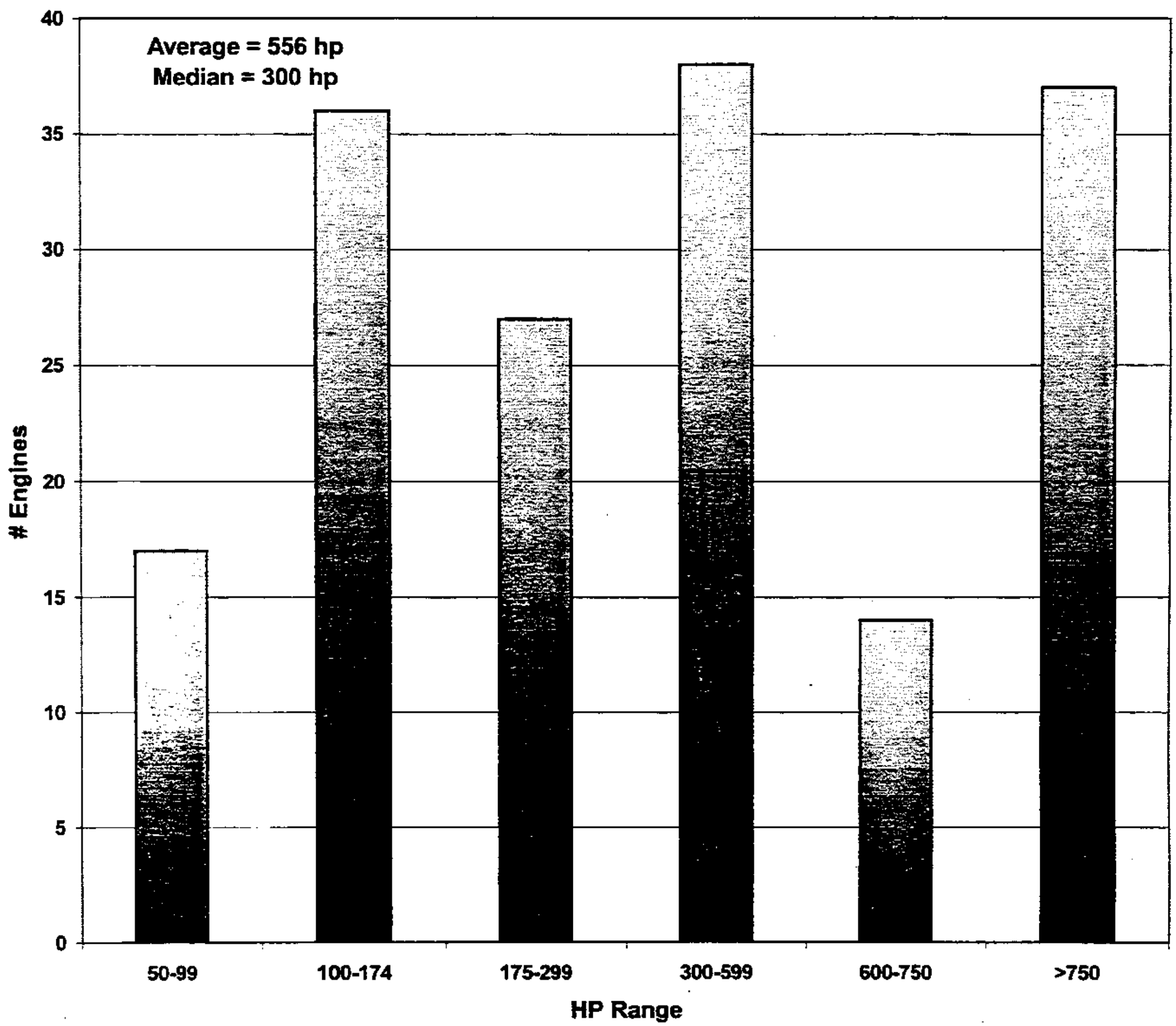
**Figure C-3: Engine Applications by District**



## C. Horsepower and Model Year

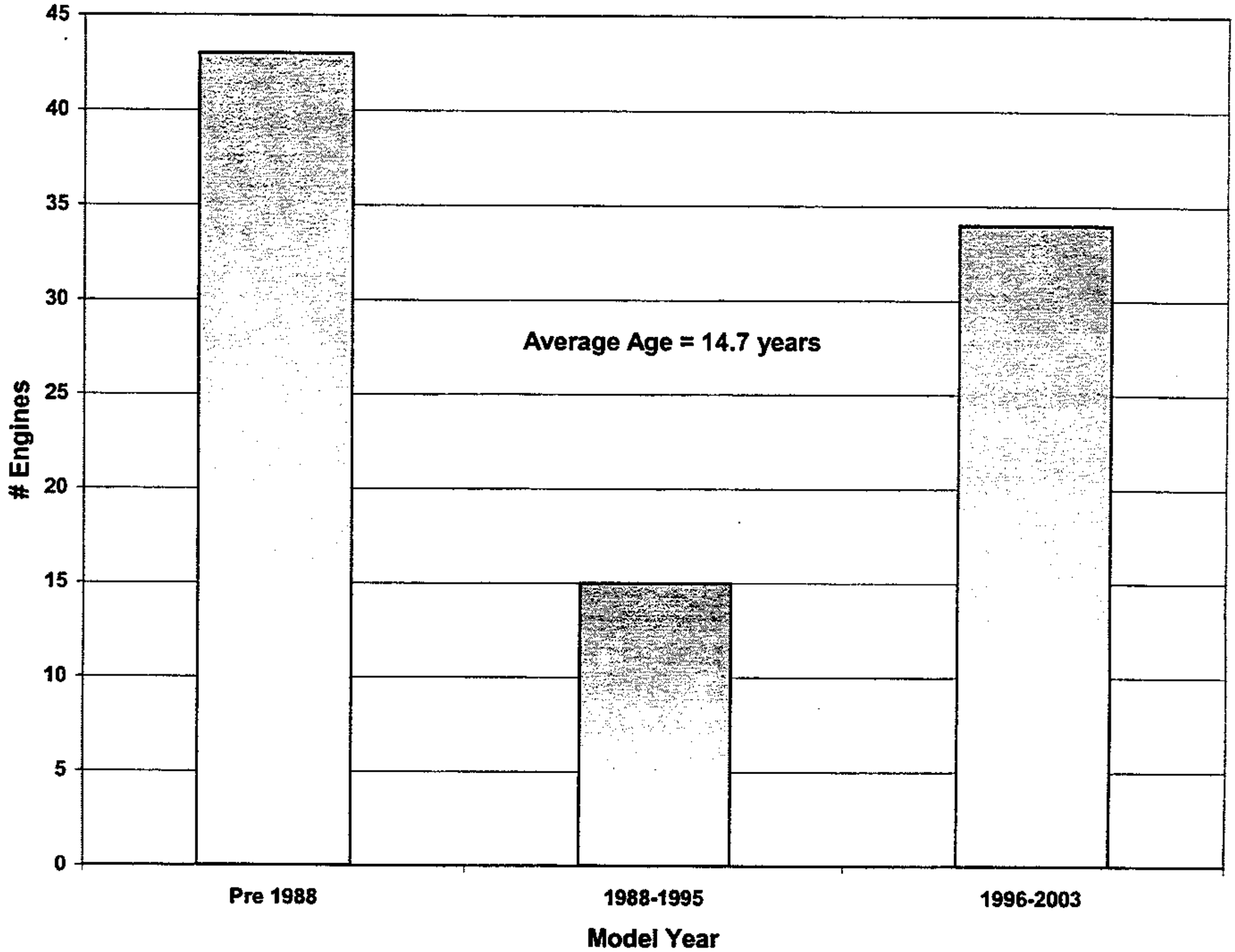
Figure C-4 shows the number of Prime Survey engines in each specified horsepower range. The engines ranged from under 50 horsepower to over 2,000 horsepower. The most populated categories were 300 to 599 horsepower, greater than 750 horsepower, and 100 to 174 horsepower, representing 66 percent of the survey engines. Our survey targeted engines greater than or equal to 50 horsepower, so while we received some data for the smaller engines, they were not included in the figure below or in the average or median horsepower ratings.

**Figure C-4: Horsepower Ranges**




Model year data was received for 92 of the 171 engines and sorted into three model year groups: pre-1988, 1988 to 1995, and 1996-2003. The corresponding data is presented in Figure C-5.

**Figure C-5: Model Year Distribution**




Tables C-2 and C-3 show the survey engine population for horsepower ranges based on their corresponding model year ranges. Table C-2 displays the engines by horsepower while Table C-3 displays the engines by model year. There were 78 engines rated over 50 horsepower that did not have model year data, while only one engine had no horsepower data.

**Table C-2: Model Year and Horsepower Ranges (by Horsepower)**

| Age Range | Total | No HP Data | 50-99 | 100-174 | 175-299 | 300-599 | 600-750 | >750 |
|---|---|---|---|---|---|---|---|---|
| No Age Data | | | 8 | 26 | 14 | 13 | 3 | 14 |
| 1996-2003 | 34 | | 5 | 8 | 1 | 8 | 4 | 8 |
| 1988-1995 | 15 | | | 2 | 4 | 4 | 4 | 1 |
| pre-1988 | 43 | 1 | 4 | | 8 | 13 | 3 | 14 |

**Table C-3: Model Year and Horsepower Ranges (by Model Year)**

| HP Range | Total | No Age Data | 1996-2003 | 1988-1995 | pre-1988 |
|---|---|---|---|---|---|
| No HP Data | | | | | 1 |
| 50-99 | 17 | 8 | 5 | | 4 |
| 100-174 | 36 | 26 | 8 | 2 | |
| 175-299 | 27 | 14 | 1 | 4 | 8 |
| 300-599 | 38 | 13 | 8 | 4 | 13 |
| 600-750 | 14 | 3 | 4 | 4 | 3 |
| >750 | 37 | 14 | 8 | 1 | 14 |

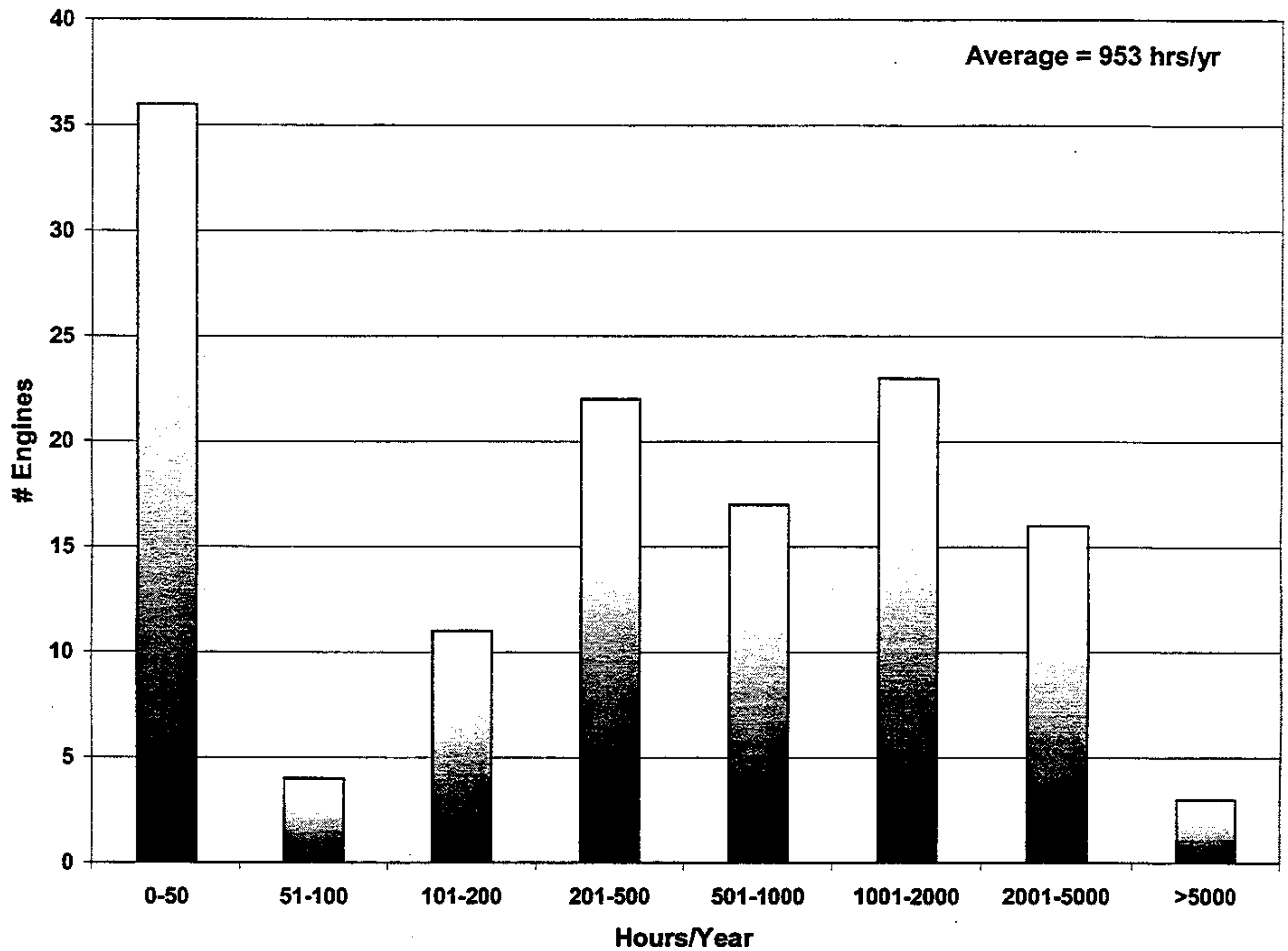
### D. Hours of Operation

The Prime Survey requested the average total hours of annual operation for each engine. Hours for prime engines can vary from a few hours per year to several thousand and can also vary based on the type of application. The average number of annual hours reported from the surveys was 953, with 132 engines reporting hours of operation data. More than 61 percent of all engines had annual hours exceeding 200 per year, while 27 percent were operated 50 hours or less per year. Table C-4 shows the average annual hours for each application, while the survey-wide hours of operation data is presented in Figure C-6.

**Table C-4: Average Hours of Operation by Application**

| Application | Average Annual Hours |
|---|---|
| air compressor | 334 |
| cogeneration | 5501 |
| crane | 1024 |
| crusher | 1114 |
| generator | 1563 |
| grinder | 798 |
| hay compressor | 1482 |
| magnetic silencer | 8 |
| mud mixer | 517 |
| pump | 46 |
| sand blaster | 313 |
| turbine starter | 22 |
| winch | <50 |
| wood chipper | 869 |
| other | 852 |

**Figure C-6: Hours of Operation Ranges**




## E. Emission Controls

Approximately 52 percent of the engines responding to the survey have some kind of emission controls, most aiming to reduce NOx, such as ignition timing retard (ITR), fuel injection, and turbocharging and aftercooling and Selective Catalytic Reduction (SCR). While ITR reduces NOx emissions by shortening the time available for combustion and lowering cylinder temperature and pressure, it generally increases HC, CO, PM , and fuel consumption for the same reasons. ITR is usually used in conjunction with other strategies (such as turbocharging and aftercooling) to counteract those increases. Several engines had particulate matter (PM) control technologies, such as diesel particulate filters (DPFs) and diesel oxidation catalysts (DOCs). Table C-5 shows the engines that reported DPFs, DOCs, and SCRs, which are the most effective emission control technologies commercially available for stationary compression-ignition engines.

**Table C-5: DPFs, DOCs, and SCRs on Stationary Prime Engines**

| Application | Control | Hours/Yr |
|---|---|---|
| rock crusher | DOC | 2500 |
| wood chipper | DOC | 2000 |
| electric power generation | DPF | 1000 |
| electric power generation | DPF | 614 |
| TRU generator | DPF | 1465 |
| wood chipper | DPF, DOC | 1000 |
| gantry crane | DPF, SCR | 2723 |
| gantry crane | DPF, SCR | 1075 |
| gantry crane | DPF, SCR | 2498 |
| gantry crane | DPF, SCR | 3761 |
| gantry crane | DPF, SCR | 3050 |
| gantry crane | DPF, SCR | 2948 |
| electric power generation | SCR | 1860 |
| electric power generation | SCR | 1860 |
| electric power generation | SCR | 1860 |
| electric power generation | SCR | 1860 |
| electric power generation | SCR | 1860 |
| electric power generation | SCR | 1860 |

## IV. Survey Package

Winston H. Hickox
*Agency Secretary*

# Air Resources Board

**Alan C. Lloyd, Ph.D.**
**Chairman**
1001 I Street • P.O. Box 2815 • Sacramento, California 95812 • www.arb.ca.gov

Gray Davis
*Governor*

March 17, 2003

Dear Madam/Sir:

## Air Resources Board Survey on Stationary Prime Engines

We are writing to ask you to fill out the enclosed Air Resources Board (ARB) survey on stationary prime engines (those that are not used for emergency/stand-by purposes and remain in one location at the facility for more than 12 months). The short survey asks questions regarding the engine's location, specifications, fuel usage, application, and operational hours. Below are answers to some questions you may have regarding the survey.

### Why is the ARB requesting this information?

We are currently developing an airborne toxic control measure (ACTM) to control particulate matter emissions from stationary diesel-fueled engines. The survey responses will give us up-to-date information on how the stationary prime engines are operated. We will use the information to identify and evaluate the impacts of emission reduction strategies for stationary diesel-fueled prime engines.

### Does the ARB have the legal authority to request the survey information?

Yes. State law authorizes the ARB to request and gather the information required to determine if regulations are needed to protect the public health from toxic air contaminants.

### What if my business/facility does not have any stationary prime engines?

Simply include your business/facility contact information, check-mark the box at the top of the form, and return it to us.

### What will the ARB do with the completed survey?

We will enter the information into a database for analysis. The results of this analysis may be discussed at future workshops and summarized in our technical documents. However, we will not publish your survey responses or the name of your business in our documents.

When does the ARB need your survey?

Please return your survey by April 11, 2003. You may either fax it to us at (916) 327-6251, or mail it to the following address:

California Air Resources Board
Attn: SSD/EAB
P.O. Box 2815
Sacramento, CA 95812-2815

The survey is also available in electronic format (Microsoft Word or Adobe Acrobat) on our website at http://www.arb.ca.gov/diesel/primesurvey.htm. Surveys completed electronically can be e-mailed to lwilliam@arb.ca.gov.

Who should I contact if I have questions regarding the survey?

You may contact Mr. Alex Santos at (916) 327-5638 or via e-mail at asantos@arb.ca.gov, or Ms. Lisa Williams at (916) 327-1498 or via e-mail at lwilliam@arb.ca.gov.

We would like to thank you in advance for responding to this survey.

Sincerely,

/s/

Daniel E. Donohoue, Chief
Emissions Assessment Branch

Enclosure

cc: Mr. Alex Santos
Air Resources Engineer
Emissions Assessment Branch

Ms. Lisa Williams
Air Resources Technician
Emissions Assessment Branc

California Environmental Protection Agency

# Air Resources Board

Business/Facility Name: ______________________

Address: ______________________

City: ______________________ Zip: ______

Contact Name: ______________________ Phone: (   ) ______ 266

E-mail Address: ______________________

## Stationary Prime Engine Survey

☐ If your business/facility does not have any prime engines, please mark this box, fill in the contact information above, check any boxes that apply, and return this form.

☐ If you are a "small business" (100 employees or less and annual gross receipts of $10,000,000 or less per Cal. Gov. Code Sec. 14837(d)(1)), please mark this box.

☐ If you have visited our website (http://www.arb.ca.gov/diesel/dieselrrp.htm) or are aware of our activities regarding stationary diesel engines, please mark this box.

**Instructions:**

1. Please fill in your contact information above and check any applicable boxes.
2. Please limit your responses to stationary prime engines only. A stationary prime engine is any engine that is not used for emergency/stand-by purposes (i.e., is not a back-up generator, fire pump, etc.) and remains in one location at the facility for more than 12 months.
3. If the engine location is not a physical address, please specify approximate location (i.e., south end of Main Street in Bakersfield).
4. If the engine has emission control equipment installed, please use the following letters:
   - A = Diesel Particulate Filter (DPF)
   - B = Ignition Timing Retard (ITR)
   - C = Diesel Oxidation Catalyst (DOC)
   - D = Selective Catalytic Reduction (SCR)
   - E = Turbo-Charged and/or After-Cooled
   - F = Other – *please specify*
5. Please fax this survey to **(916) 327-6251**, or mail it to the address on the back of this form. If completing electronically, please e-mail to lwilliam@arb.ca.gov.

| Permit # (if permitted) | Engine Location (address) | Engine Make | Engine Model | Serial # | Model Year | Rated Horse-power | Control Equip. (see #4 above) | Fuel Type | Fuel Usage Rate | Application (general use) | Typical Load (% of rated HP) | Average Total Hours Operated per Year | Normal Hours of Operation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Example* | *123 Main St., Sacramento* | *Cummins* | *3451D* | *5Y45M -23F70* | *1985* | *750* | *E* | *Off-Road Diesel* | *10 gal per week* | *wood chipping* | *15 – 25%* | *1800* | *Mon-Fri 8am-5pm* |
| | | | | | | | | | | | | | |
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# Appendix D

# Emissions Inventory Methodology

# STATIONARY DIESEL ENGINES (Non-Agricultural Engines)

*(Issued September 15, 2003)*

**EMISSION INVENTORY SUMMARY CATEGORY**
Stationary Sources - Fuel Combustion

**EMISSION INVENTORY CODES (CES CODES) AND DESCRIPTION**
099-040-1200-0000 (89664) Stationary Non-Agricultural Engines - Diesel

## EXECUTIVE SUMMARY

To support development of the Air Toxic Control Measure (ATCM) for stationary diesel engines, ARB staff worked with local air districts to develop a single statewide methodology and updated population and emission estimates for these engines. Equipment types considered include air compressors, prime and backup generators, prime and backup pumps, and other miscellaneous stationary diesel engines. Population and emission estimates for agricultural irrigation engines were not included in this methodology.

Based on this methodology, ARB estimates that in the year 2002 there were approximately 21,000 stationary diesel-fueled engines statewide. Backup generators was the most common stationary diesel equipment type (56%), followed by backup pumps (37%), prime generators (3%), prime pumps (2%), and others (1%). Air compressors were found to be primarily portable and therefore were a negligible stationary source category, both in terms of population and emissions. Allocation of engines to local air districts relied on human population as a surrogate. Consequently, over 85% of the statewide stationary diesel engine population was attributed to the following five districts: South Coast AQMD, Bay Area APCD, San Joaquin Valley Unified APCD, San Diego APCD, and Sacramento AQMD. We are aware that our district-specific estimates do not always agree with district estimates; however, this discrepancy will be addressed as the ATCM is implemented.

ARB estimates that in 2002, stationary diesel-fueled engines in California emitted 1.1 tons per day of diesel PM. In addition, those engines are estimated to have emitted 20.3 tons per day of oxides of nitrogen (NOx), 1.8 tons per day of reactive organic gases (ROG), and 6.9 tons per day of carbon monoxide (CO). Although backup engines make up over 50% of the stationary diesel engine population, they contribute less than 20% of the overall emissions due to their relatively low annual hours of operation. On the other hand, due to their relatively high number of hours of operation, prime generators and prime pumps are estimated to contribute the majority of stationary diesel engine emissions (35% and 23%, respectively). In the future, ARB estimates that the population of stationary diesel-fueled engines will increase at a rate roughly proportional to the rate of human population growth but that emissions will decrease due to the implementation of the stationary diesel ATCM.

## BACKGROUND

In October 2000, the California Air Resources Board (ARB) published the Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-fueled Engines and Vehicles. That plan outlined a strategy for the reduction of diesel particulate matter (PM) by 75 percent by 2010 and by 85 percent by 2020. Sources of diesel PM include stationary sources, portable sources, on-road sources, and off-road sources (excluding the portable sources).

To meet the diesel PM emission reduction goals set forth in the diesel risk reduction plan, the ARB began the process of drafting air toxic control measures (ATCMs). ATCMs are regulatory in nature. Essential components of any regulation being developed are the cost effectiveness component and the regulatory effectiveness component. Essential to those components is a comprehensive and accurate emission inventory.

This methodology estimates the statewide population and emissions for stationary non-agricultural diesel engines, including air compressors, generators, pumps, and other types of equipment. Stationary engines associated with agricultural processes are not included in this emission estimation method. Estimation of the population and emissions from agricultural engines is described in an April 30, 2003 California Air Resources Board (ARB) memorandum entitled "Updated Statewide Population and Emission Inventory for Diesel-Fueled Agricultural Irrigation Pumps" (see Attachment G).

Stationary non-agricultural diesel engines are assumed to be engines that remain at a facility for at least 12 months, regardless of whether the engine is on wheels or a skid. Stationary diesel engines range in horsepower from less than 15 horsepower to over 3000 horsepower.

The stationary diesel engine inventory presented here is based upon reconciliation of district permit data for selected districts and Power Systems Research (PSR) data for all districts. The methodology allows the development of a more comprehensive and representative stationary diesel engine emission inventory, as additional data become available.

# METHODS AND SOURCES

## Engine Population

The population of stationary diesel engines was estimated for the following equipment types: air compressors, generators (prime and backup), pumps (prime and backup), and others (including crushers, grinders, cranes, and others).

The stationary diesel engine population was based on population estimates originally described in the ARB's OFFROAD model database of non-road mobile diesel engines. The OFFROAD population estimates were developed from nationwide engine sales data provided by PSR in 1996 and the ARB Stationary Source Division (SSD) Portable Equipment Database.

PSR is an independent research firm involved in research and development related to engine and engine component industries. The PSR database contains North American engine sales data compiled between 1989-1996 and reports engine populations by equipment type to the statewide level. The ARB staff estimated county-specific engine populations by spatially allocating the statewide PSR data using year 2002 county-specific human population data from the California Department of Finance (see Attachment A). The engine population for the year 2002 reported here was estimated using PSR 1996 engine population estimates that were grown to the year 2002 using growth and control surrogates found in the OFFROAD model.

Table 1

**Distribution of Mobile and Stationary Diesel Engines**

| HP | Fraction Mobile $Frac_{hp,ms}$ | Fraction Stationary $Frac_{hp,ss}$ |
|---|---|---|
| 0-25 | 1 | 0 |
| 25-50 | 0.9 | 0.1 |
| 51-120 | 0.7 | 0.3 |
| 121-175 | 0.2 | 0.8 |
| 176-250 | 0.15 | 0.85 |
| 251-500 | 0.1 | 0.9 |
| 501-750 | 0.1 | 0.9 |
| >750 | 0.1 | 0.9 |

Data Source: "Off-Road Mobile Equipment Emission Inventory Estimate", Booz Allen & Hamilton (BAH), January 1992

The PSR database does not differentiate between mobile and stationary engines. To estimate the number of stationary diesel engines, mobile-stationary splits by horsepower class were applied to the overall inventory of diesel engines reported by PSR. These mobile-stationary splits, which are shown in Table 1 (page 3), are based on a report published by Booz-Allen & Hamilton in 1992.

The majority of small horsepower diesel engines are assumed to be mobile while most large horsepower engines are assumed to be stationary. The OFFROAD model supplied the mobile diesel engine population estimates based on the PSR database, and the relative fractions of stationary to mobile engines were used to estimate the stationary engine population. The resulting OFFROAD-PSR stationary diesel engine population is shown in Table 2 (page 4). A complete listing of this data, broken down by County, Air Basin, and District, is contained in Attachment D.

**Table 2**
**2002 OFFROAD-PSR Statewide Diesel Engine Population**

| Equipment Type | Horsepower Class | Mobile | Stationary | Total |
|---|---|---|---|---|
| | | $Frac_{hp,ms}$ | $Frac_{hp,ss}$ | $Frac_{hp,ms} + Frac_{hp,ss}$ |
| Air Compressors | 0 to 15 | 53 | 0 | 53 |
| | 16 to 25 | 109 | 0 | 109 |
| | 25 to 50 | 959 | 104 | 1063 |
| | 51 to 120 | 6413 | 2748 | 9161 |
| | 121 to 175 | 251 | 1005 | 1256 |
| | 176 to 250 | 345 | 1959 | 2304 |
| | 251 to 500 | 305 | 2744 | 3049 |
| | 501 to 750 | 13 | 112 | 125 |
| | >750 | 4 | 32 | 36 |
| Generator Sets | 0 to 15 | 5214 | 0 | 5214 |
| | 16 to 25 | 3814 | 0 | 3814 |
| | 25 to 50 | 4663 | 520 | 5183 |
| | 51 to 120 | 7211 | 3088 | 10299 |
| | 121 to 175 | 291 | 1163 | 1454 |
| | 176 to 250 | 333 | 1888 | 2221 |
| | 251 to 500 | 442 | 3975 | 4417 |
| | 501 to 750 | 105 | 951 | 1056 |
| | >750 | 105 | 951 | 1056 |
| Pumps | 0 to 15 | 3916 | 0 | 3916 |
| | 16 to 25 | 1170 | 0 | 1300 |
| | 25 to 50 | 2039 | 222 | 2265 |
| | 51 to 120 | 4002 | 1718 | 5717 |
| | 121 to 175 | 459 | 1835 | 2295 |
| | 176 to 250 | 176 | 1002 | 1176 |
| | 251 to 500 | 354 | 3183 | 3538 |
| | >500 | 22 | 198 | 223 |
| Other | 0 to 15 | 2013 | 0 | 2013 |
| | 16 to 25 | 1615 | 0 | 1794 |
| | 25 to 50 | 4907 | 543 | 5452 |
| | 51 to 120 | 3770 | 1611 | 5386 |
| | 121 to 175 | 18 | 67 | 90 |
| | Total | 55092 | 31619 | 86711 |

Data Sources: Mobile ARB OFFROAD Model; Stationary - this methodology

Based on a telephone survey of local air districts, review of district permit data, and discussions with engine distributors, ARB staff concluded there are very few stationary diesel air compressors statewide and that the majority should be classified as portable equipment. Of the estimated statewide population of 8,452 air compressors shown in Table 2 (page 4), the ARB staff telephone survey found five air compressors that were considered stationary. These engines were left out of the horsepower reallocation described here because there were so few of them and they were specifically identified by location and size.

ARB conducted a similar telephone survey of district staff and reviewed district permit data to verify the numbers of "Other" engines that the PSR database assumed to be stationary (Table 2). The PSR data identified most of those engines as welders or pressure washers. The ARB survey indicated that the vast majority of those engines designated as "Others" were portable and should be designated as such. The revised numbers of "Other" engines is also reflected in Table 9 (page 17). The "Other" engine survey population was further split by county, air basin, and district using the Department of Finance human population data found in Attachment A. Like the air compressors, these engines were left out of the horsepower reallocation because there were so few of them and they were specifically identified by location and size.

In an effort to verify the stationary engine population estimates estimated using the OFFROAD-PSR database, the ARB staff compared the OFFROAD-PSR estimates with diesel engine permit information in local air district files. Since there is no comprehensive statewide permit database of stationary diesel engines, permit data from the following districts was solicited: Sacramento Metropolitan Air Quality Management District (SMAQMD), San Diego County Air Pollution Control District (SDCAPCD), San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD), and South Coast Air Quality Management District (SCAQMD). These districts were selected because they permit prime and back-up engines and their engine populations reflect a representative mix of urban and agricultural applications. Combined, these four districts represent approximately 58% of the stationary non-agricultural diesel engine population in California.

**Table 3**
**Comparison of Stationary Diesel Engine**

| Horsepower Class | Permit Population | OFFROAD-PSR Database |
|---|---|---|
| 0 -50 | 14 | 751 |
| 50 - 120 | 1425 | 3728 |
| 120 - 175 | 697 | 1779 |
| 175 - 250 | 667 | 1677 |
| 250 - 500 | 1118 | 4157 |
| 500 - 750 | 978 | 551 |
| 750 - 1000 | 740 | 669* |
| 1000 - 1500 | 741 | |
| 1500 - 2000 | 322 | |
| 2000 - 3000 | 521 | |
| >3000 | 18 | |
| Total | 7241 | 13312 |

Includes Sacramento, San Joaquin Unified, San Diego, and South Coast Districts

* 669 engines greater than 750 hp

Table 3 (page 5) compares the stationary engine population estimates by horsepower class developed for those four districts based on the OFFROAD-PSR database and district permit files. For the four districts considered, the total number of stationary non-agricultural diesel engines in district permit files (7,241 engines) is approximately 54% of the total number of engines predicted by the PSR data (13,312 engines) for those districts. The discrepancies between the district permit data and the OFFROAD-PSR population estimate varies based on the horsepower class considered. For engines less than 750 hp, permit files contain 4,899 engines or 39% of the 12,643 engines predicted by the

OFFROAD-PSR database. For engines greater than 750 hp, permit files contain 2,342 engines or three and one half times of the 669 engines predicted by the OFFROAD-PSR database.

District permit data indicates that the horsepower range distribution of the OFFROAD-PSR data does not represent the actual horsepower range distributions for stationary engines found in California, particularly for large engines. For example, the PSR data does not estimate engines greater than 750 horsepower but the available district permit data shows that at least 10 percent of permitted engines are greater than 750 horsepower. For this emission inventory update, the district permit data was assumed to be more representative of the numbers of large engines (greater than 750 hp), and the OFFROAD-PSR data were used to allocate smaller engines (less than 750 hp).

One of the shortcomings of the OFFROAD-PSR data is that it cannot be used to determine the principal way an engine is used, particularly generators and pumps. The OFFROAD-PSR data does not segregate generators and pumps into their prime and backup uses. Prime and backup engines are used in significantly different ways and therefore have different emission rates. The district permit data were used to address this issue and serve as a template to distribute the baseline populations of generators and pumps by principal usage.

To differentiate between prime and backup generators and pumps, the ARB staff analyzed district permit data and engine data from the California Energy Commission for the four districts listed above. Since the data for the Sacramento Metropolitan Air Quality Management District and the San Diego Air Pollution Control District was the most recent and complete, composite percentages were developed using the data from those two districts. The numbers of prime and backup engines were recorded for each district and totaled. That resulted in a ratio of five percent prime to ninety-five percent backup for both generators and pumps.

The ratio of the number of 750 hp or greater permitted engines to the total number of engines in the baseline database was used to split the original baseline population at 750 hp. This ratio was developed using only data from districts for which both permit and OFFROAD-PSR data was available (i.e. SMAQMD, SDCAPCD, SJVUAPCD, SCAQMD). The relative horsepower class ratios of baseline engines less than 750 hp (Table 4, page 7) and the relative horsepower class ratios of permitted engines greater than 750 hp (Table 5, page 7) were then used to further allocate engines amongst the horsepower classes for all districts. Tables 4 and 5 (page 7) show the horsepower classes and the ratios used to allocate the baseline population. The composite engine horsepower distribution is shown in Table 6 (page 8).

Table 4

## OFFROAD-PSR Engine Population

| Horsepower Class | Population | Total Engines | Percent of <750 hp Engines | Percent of All OFFROAD Engines |
|---|---|---|---|---|
| 0 -50 | 742 | 742 | 4% | 4% |
| 50 - 120 | 4806 | 5548 | 25% | 23% |
| 120 - 175 | 2998 | 8546 | 15% | 14% |
| 175 - 250 | 2890 | 11436 | 15% | 14% |
| 250 - 500 | 7158 | 18594 | 37% | 35% |
| 500 - 750 | 951 | 19545 | 5% | 5% |
| >750 | 1149 | 20694 | | 6% |
| *Not including air compressors, pressure washers, welders | | | | |

Table 5

## District Permit Data*

| Horsepower Class | Population | Total Engines | Percent of >750 hp Engines | Percent of All District Permit Engines |
|---|---|---|---|---|
| 0 -50 | 14 | 14 | | 0% |
| 50 - 120 | 1425 | 1439 | | 20% |
| 120 - 175 | 697 | 2136 | | 10% |
| 175 - 250 | 667 | 2803 | | 9% |
| 250 - 500 | 1118 | 3921 | | 15% |
| 500 - 750 | 978 | 4899 | | 14% |
| 750 - 1000 | 740 | 5639 | 32% | 10% |
| 1000 - 1500 | 741 | 6380 | 32% | 10% |
| 1500 - 2000 | 322 | 6702 | 14% | 4% |
| 2000 - 3000 | 521 | 7223 | 22% | 7% |
| >3000 | 18 | 7241 | 1% | 0.249% |

* Permit data not available for all districts.

Total Permitted Engines>750 hp = 2342
Engines in OFFROAD-PSR database for these Districts = 11349
2342/11349 = 20.636% of engines > 750 hp

| Table 6 | | | | | |
|---|---|---|---|---|---|
| **Composite Engine Horsepower Distribution** | | | | | |
| **Horsepower Class** | **Population** | **Total Engines** | **Percent of All Engines** | **Number of Engines** | **Percent of Engines** |
| 0 -50 | 623 | 623 | 3.0% | 16424 | 79% |
| 50 - 120 | 4038 | 4662 | 19.5% | | |
| 120 - 175 | 2519 | 7181 | 12.2% | | |
| 175 - 250 | 2428 | 9610 | 11.7% | | |
| 250 - 500 | 6015 | 15624 | 29.1% | | |
| 500 - 750 | 799 | 16424 | 3.9% | | |
| 750 - 1000 | 1349 | 17773 | 6.5% | 4270 | 21% |
| 1000 - 1500 | 1351 | 19124 | 6.5% | | |
| 1500 - 2000 | 587 | 19711 | 2.8% | | |
| 2000 - 3000 | 950 | 20661 | 4.6% | | |
| >3000 | 33 | 20694 | 0.2% | | |
| **Total** | **20694** | | **100%** | 20694 | 100% |

After engines were distributed among counties, equipment types, and horsepower ranges, they were allocated by age using the diesel engine age distribution shown in Attachment B. The age distribution for prime engines is identical to the one used in the ARB's OFFROAD model. For backup engines, analysis of district permit data indicated that backup engines tend to be in use much longer than prime engines. This analysis showed that backup engines can be up to 50 years old, and approximately 20% of backup engines are at least 20 years old. This information was used to adjust the age distribution for prime engines to create a composite age distribution for backup engines.

The population of stationary engines for a specific equipment type, horsepower range, and model year can be estimated using the following steps:

Step 1. This step is necessary to estimate the numbers of stationary engines based on the total number engines associated with the OFFROAD-PSR national engine population data.

$$Pop_{et,ss,dis} = Sum\ (Pop_{et,hp,ms,dis} * Frac_{hp,ss} / Frac_{hp,ms})$$

Where: $Pop_{et,\,ss,dis}$ = Stationary engine population for equipment type *et* in District *dis.*
$Pop_{et,hp,ms,dis}$ = Mobile engine population(from PSR database) for equipment type *et,* horsepower *hp* for District *dis.* (see Table 2, page 3)
$Frac_{ss,hp}$ = Fraction of engines of horsepower *hp* that are stationary (see Table 1, page 2)
$Frac_{ms,hp}$ = Fraction of engines of horsepower *hp* that are mobile (see Table 1, page 2)

Step 2. This step is necessary to estimate the numbers of engines by horsepower class.

$$Pop_{et,hp,ss,dis} = Pop_{et,ss,dis} * Frac_{hp}$$

Where: $Pop_{et,hp,ss,dis}$ = Stationary engine population for equipment type *et* of horsepower *hp* in District *dis.*
**Frac**$_{et,hp}$ = Fraction of horsepower class *hp* engines (from Table 6, page 7)

Step 3. This step is necessary to estimate the numbers of prime versus backup engines in each horsepower class.

$$Pop_{((pr,ba),hp,ss,dis)} = Pop_{et,hp} * Frac_{(pr,ba)}$$

Where: $Pop_{(pr,ba),hp,ss,dis}$ = Stationary engine population of either prime or backup engines for equipment type *et* of horsepower *hp* in District *dis.*
$Pop_{et,hp}$ = Total stationary engine population of given equipment type *et* and horsepower class *hp* (pumps or generators only)
$Frac_{(pr,ba)}$ = Fraction of either prime or backup equipment for given equipment type from district permit data

Step 4. This step is necessary to estimate the numbers of engines of a particular horsepower class that belong to a specific model year. Knowing the model year is essential to assigning emission factors for a specific subset of engines.

$$Pop_{et,my,ss,dis} = Pop_{et,by,hp,dis} * AD_{my}/100$$

Where: $Pop_{et,my,ss,dis}$ = Stationary engine population for equipment type *et,* model year *my* in District *dis.*
$Pop_{et,by,hp,dis}$ = Stationary engine population for equipment type *et,* base year *by*, horsepower class *hp* in District *dis.*
$AD_{my}$ = Percent Age Distribution for model year *my* (from Attachment B).

## Sample Calculations:

### Population:

Population of 1988 model year backup generators between 250 and 500 horsepower in base year 2002, Los Angeles County, South Coast Air Basin, South Coast AQMD:

Step 1.

$$\mathbf{Pop_{et,hp,my,ss} = Sum(Pop_{et,hp,by,ms} * AD_{my} * Frac_{hp,ss} / Frac_{hp,ms})}$$

(see table 7 below, data from Attachment E, page D-19)

Table 7

| OFFROAD-PSR Data for Generator Sets in Los Angeles County, South Coast Air Basin, South Coast AQMD | | | | | |
|---|---|---|---|---|---|
| Horsepower Class | $Pop_{et,hp,by,ms}$ (from Offroad-PSR database) | $Frac_{hp,ss}$ (from Table 1) | $Frac_{hp,ms}$ | $Frac_{hp,ss}$/ $Frac_{hp,ms}$ (calculated) | $Pop_{et,hp,by,ss}$ (calculated) |
| 0-25 | 2453 | 0 | 1 | 0.00 | 0 |
| 25-50 | 1267 | 0.1 | 0.9 | 0.11 | 141 |
| 50-120 | 1959 | 0.3 | 0.7 | 0.43 | 840 |
| 120-175 | 79 | 0.8 | 0.2 | 4.00 | 316 |
| 175-250 | 90 | 0.85 | 0.15 | 5.67 | 512 |
| 250-500 | 120 | 0.9 | 0.1 | 9.00 | 1081 |
| 500-750 | 29 | 0.9 | 0.1 | 9.00 | 257 |
| >750 | 29 | 0.9 | 0.1 | 9.00 | 257 |
| Total Generator Sets for Los Angeles County, South Coast Air Basin, South Coast AQMD | | | | | **3404** |

Step 2. $\mathbf{Pop_{et,,hp,ss,dis} = Pop_{et,ss,dis} * Frac_{hp}}$

$Pop_{et,ss,dis}$ =3404 (from step 1)

$Frac_{250-500}$ = 0.2906 (from Table 6, page 8)

$Pop_{et,et,hp,ss,dis}$ = 2842 * 0.2906= 989.4 generator sets between 250 and 500 hp

Step 3. $\mathbf{Pop_{(pr,ba)} = Pop_{et,} * Frac_{(pr,ba)}}$

$Pop_{et,}$ =989.4 generator sets (from step 2)

$Frac_{(pr,ba)}$ = 0.95 backup generators (see text)

$Pop_{(pr,ba)}$ = 989.4 * 0.95 = 939.9 backup generators between 250 and 500 hp.

Step 4. $\mathbf{Pop_{et,my,ss,dis} = Pop_{by,et,hp,dis} * AD_{my}}$

$Pop_{by,et,hp,dis}$ = 989 engines (from Step 3)

$AD_{my}$ = 3.77% (value for 1988, from Attachment B)

$Pop_{et,my,ss,dis}$ = 989 * 3.77/100 = 37.28 backup generators, 1988 model year, in Los Angeles County, South Coast Air Basin

## Emission Estimations

### Activity Data

The average horsepower, load factor and activity (as a function of the annual hours of operation) vary by engine type and by horsepower range for each equipment type. Assumptions for each are shown in Attachment C.

"Average horsepower" is the average rated horsepower (assumed to be constant by calendar year) based on the assumption that the power demand for an equipment type does not change with time. The values used in this methodology are from the PSR database for engines less than 750 hp and from district permit data for engines greater than 750 hp.

"Load factor" is the average operation level for a given application expressed as a percent of the engine manufacturer's maximum horsepower rating. It has been assumed in the 1996 PSR database that engine type will operate at an average load factor. The load factor is used to adjust the maximum rated horsepower to horsepower levels under day-to-day operating conditions.

"Activity" is the measure of an engine type's average annual hours of operation. For most engine types, the 1996 PSR database is the source of engine activity data, but because there was no specific activity data available for prime and backup generators or pumps, ARB survey data described immediately below is used to estimate activities for backup generators and backup pumps.

The ARB conducted a number of surveys of District permitted engines to gather specific information about prime and backup engines operating in California. From these surveys, the ARB staff was able to develop activity data for prime generators and pumps, as well as backup generators and pumps. The annual activity for backup generators and pumps is assumed to be thirty (30) hours per year. The activity data for prime engines was also based on survey data. The annual activity for prime generators and prime pumps assumed to be 953 hours per year (the average for all prime engines responding to the ARB's survey of prime engine owner/operators). Attachment A shows the activities that were assigned to all equipment classes.

### Emission Factors

Emission factors (Attachment D) were obtained from Appendix A of the ARB's OFFROAD Model Documentation (Reference 1). They are based on the U.S. Environmental Protection Agency's adopted diesel standards and reflect California regulations. These emission factors are for certified engines only, however; there is no requirement that commercial diesel engines meet certification requirements. Accordingly, it was assumed that when new engine standards come into effect, there will be low compliance level with certified engine emission standards, since purchasers of new commercial diesel engines can legally opt to buy uncertified engines. It was further assumed that as time goes on, more and more new engines will meet the certified emission standard. Accordingly, the certified emission factors shown in Attachment D were weighted in such a manner that emission factors descend gradually rather descend suddenly when new emission standards are implemented.

The emission factors are composed of zero-hour (new equipment) emissions and deterioration rates. The emission factors can be expressed by the following equation:

$$EF_{et,hp,my,pol} = ZH_{et,hp,my,pol} + DR_{et,hp,my,\ pol} * CHrs_{et,hp}$$

Where: $EF_{et,hp,my,po}$ = emission factor, in grams per horsepower-hour (g/hp-hr) for equipment type *et*, horsepower *hp*, model year *my*, and pollutant *pol.*

$ZH_{et,hp,my,pol}$ = zero-hour emission rate, or when the equipment is new (g/hp-hr) for equipment type *et*, horsepower *h*, model year *my*, and pollutant *pol.*

$DR_{et,hp,my,\ pol}$ = deterioration rate, or the increase in ZH emissions as the equipment is used (g/hp-hr$^2$) for equipment type *et*, horsepower *hp*, model year *my*, and pollutant *pol.*

$CHrs_{et,hp}$ = cumulative hours, or total number of annual hours of use for equipment type *et*, horsepower *hp*, and model year *my*.

The zero-hour emission rates and the deterioration rates are shown in Attachment B. These factors vary by engine horsepower rating and model year only. They are the same factors used in the OFFROAD model for estimating emissions from non-road mobile diesel engines.

The cumulative hours of operation are calculated by multiplying the age of the engine (the model year) by the activity, or the number of hours per year that the engine operates. The activity varies by equipment type and is shown in Attachment A. The activities assumed for stationary diesel engines are the same as those assumed in the OFFROAD model for non-road mobile diesel engines.

Emissions per day are calculated using the following equation:

$$EMS_{TOTAL} = Sum(EMS_{et,hp,my})$$

Where:

*et*-equipment type (air compressors, generators, pumps, and other);
*hp*-horsepower range;
*my*-model years considered (1970 through 2002 (32 years total))

$$EMS_{et,hp,my} = EF_{et,hp,my} * HP_{et} * LF_{et,hp} * Activity_{et,hp} * CF * Pop_{et,hp,my}$$

Where:

$EMS_{et,hp,my}$ = amount of pollutant in tons per day (tons/day) for equipment type *et*, horsepower *hp*, and model year *my*.
$EF_{et,hp,my}$ = emission factor in grams per horsepower-hour (g/hp-hr) for equipment type *et*, horsepower *hp*, and model year *my*.
$HP_{et}$ = Maximum rated average horsepower for equipment type *et*.
$LF_{et,hp}$ = Load factor for equipment type *et* and horsepower *hp*
$Activity_{et,hp}$ = annual activity in hours per year (hr/yr) for equipment type *et* and horsepower *hp*
CF = conversion factor to convert units of grams per year to tons per day
$Pop_{et,hp,my}$ = Number of engines of type *et*, horsepower *hp*, and model year *my*.

## Sample Calculations:

**Emission Factor:**
Base Year 2002 NOx Emission Factor for backup generators between 250 and 500 horsepower, Model Year 1988, Los Angeles County, South Coast Air Basin, South Coast AQMD

$$EF_{et,hp,my,pol} = ZH_{et,hp,my,pol} + DR_{et,hp,my,\ pol} * CHrs_{et,hp}$$
$$CHrs_{et,hp} = (\text{Base Year} - \text{Model Year}) * \text{Activity}$$

Where: $ZH_{et,hp,my,pol}$ = zero-hour emission rate, in g/hp-hr = 11.0 g/hp-hr, 1987 factor (from Attachment D)
$DR_{et,hp,my,\ pol}$ = deterioration rate, in g/hp-hr = 0.000183 (from Attachment D)
Base Year = 2002
Model Year = 1988
Activity = 30 hours/year (from Attachment B)
$CHrs_{et,hp}$ = cumulative hours = (base year – model year)*Activity = (2002 – 1988=14 years) * 30 hours/year = 420 hours
EF = ZH + DR * CHrs = 11.0 + 0.000183 * 420 =
EF = **11.1 gm/hp-hr**

**Emissions:**
2002 NOx Emissions for backup generators between 250 and 500, Model year 1988, Los Angeles County, South Coast Air Basin, South Coast AQMD:

$$\mathbf{EMS_{et,hp,my} = EF_{et,hp,my}*HP_{et}*LF_{et,hp}*Activity_{et,hp}*CF * Pop_{et,hp,my}}$$

Where: $\mathbf{EF_{et,hp,my}}$ = 11.1 gm/hp-hr (from above)
$HP_{et}$ = 363 hp (from Attachment C)
$LF_{et,hp}$ = 0.74 (from Attachment C)
$Activity_{et,hp}$ = 30 hours/year (from Attachment C)
CF: 1 gram/year= (0.0000011 ton/year)/365 days/year = 3.0137E-09 tons/day
$Pop_{et,hp,my}$ = 37.3 engines (1988 model year, see above)

$EMS_{et,hp,my}$ = 11.1 gm/hp-hr * 363 hp * 0.74 * 30 hours/year * 3.0137E-09 ton/day * 37.3 engines

**$EMS_{et,hp,my}$ = 0.0100 tons/year**

**Forecasting Population and Emissions to 2002**
The year 2002 engine populations provided in this methodology were grown using the OFFROAD model, based on the 1996 PSR engine populations. The growth surrogates used in the OFFROAD model were obtained from a 1994 study by California State University, Fullerton (CSUF) entitled "A Study to Develop Projected Activity for Non-Road Mobile Categories in California, 1970-2020". For non-agricultural diesel engines, the surrogates used were a combination of projected employment growth and change in human population. The CSUF growth surrogates were used for all of the local air districts, with the exception of Bay Area Air Quality Management District and South Coast Air Quality Management District, who provided their own growth estimates.

**Forecasting Population and Emissions Beyond 2002**
Future year engine populations and emissions for the years 2010 and 2020 were estimated using the methodology set forth in the documentation for the OFFROAD model (Reference 6). The emissions projections provided in this methodology reflect both growth and control assumptions for future years. Because forecasted employment growth surrogates previously used were not available, county-specific human populations from the Department of Finance (DOF) were used as a growth surrogate in developing the stationary diesel engine populations. Based on the most recent DOF data, human population is projected to increase statewide at 1.7% per year between the years 2002 and 2020. Growth rates vary by county and this is reflected in the emission projections provided in this methodology. Control assumptions reflected in the emission projections include current federal and state emission standards.

The only exception to the growth scenarios is for South Coast AQMD. South Coast Rule 1110.2 establishes strict NOx emissions limits whose net effect is that no new prime diesel engines will be permitted in the South Coast AQMD beginning in 2003. In developing 2010 and 2020 emissions projections for the South Coast, it was therefore assumed that no new prime engines would enter the fleet between 2003 and 2020.

## RESULTS

As shown in Table 9 (page 18), it is estimated there are 20,983 stationary non-agricultural diesel engines in California. Of these, the majority are backup generators and backup pumps (11,909 and 7,750 engines, respectively). Of the remaining stationary engines, 627 are prime generators, 408 are prime pumps, 5 are air compressors, and 284 are other (including crushers, grinders, cranes, turbine starters, and others). As shown in Table 10 (page 19), over 85% of the statewide stationary diesel engine population is found in the following five districts: South Coast AQMD, Bay Area APCD, San Joaquin Unified APCD, San Diego APCD, and Sacramento AQMD.

Emissions of ROG, NOx, PM, and CO by district and stationary diesel engine equipment type are shown in Table 11 (page 20). ROG, NOX, PM, and CO emissions from these engines are estimated to be 1.8, 20.3, 1.1, and 6.9 tons per day, respectively. The majority of the emissions occur in those districts with the largest stationary diesel engine populations. A detailed breakdown of engine population and emissions by district, air basin, county, equipment type, and horsepower class is provided in Attachment E.

Forecasted emissions for 2005, 2010, 2015, and 2020 are shown in Table 12 (page 21). Despite increases in the number of engines, emissions decline in future years due to the introduction of new emission controls for non-road engines by the US Environmental Protection Agency and the California Air Resources Board. Taking into account the growth and control assumptions described previously. Table 12 shows that emissions from nonagricultural stationary diesel engines are projected to decline by 58%, 46%, 49%, and 63% between the years 2005 and 2020 for ROG, NOX, CO, and PM, respectively. The percent emission reductions vary by equipment type because of South Coast AQMD rule 1110.2 (see above) and methodological differences in the development of the "other" equipment population.

We believe that the statewide total engine population and emissions estimates presented here are the most accurate possible based on data available at this time. We recognize that the district-specific engine population and emissions estimates presented in this methodology may not agree with those of the districts. This is due to the necessity of using county-specific human population as a spatial surrogate to allocate statewide engine populations to specific districts. We are aware that the current spatial surrogate does not reflect the possibility that rural areas may have a higher percentage of stationary diesel engines for a given population. Specifically, it is likely that our engine population estimates may be low for rural districts such as the Mojave Desert AQMD and high for urban districts such as the South Coast AQMD and the San Diego APCD. We intend to resolve the majority of the uncertainties and apparent discrepancies in the district-specific estimates as the Stationary Diesel ATCM is implemented and more detailed engine count data become available.

Table 8

"Other" Diesel Engine Population

| District | Equipment | Horsepower Class | Engine Population |
|---|---|---|---|
| Bay Area AQMD | Other | 120 | 19 |
| | | 175 | 14 |
| | | 250 | 13 |
| | | 500 | 27 |
| | | 750 | 21 |
| | | 1000 | 3 |
| | | 1500 | 7 |
| | | 2000 | 4 |
| | | 3000 | 6 |
| Monterey Bay Unified APCD | Air Compressor | 500 | 1 |
| Northern Sierra AQMD | Crusher | 120 | 1 |
| | | 500 | 1 |
| | Other | 50 | 1 |
| | | 120 | 1 |
| | | 500 | 1 |
| Placer County APCD | Turbine_Starter | 500 | 1 |
| Sacramento Metropolitan AQMD | Crusher | 500 | 1 |
| | Other | 120 | 1 |
| San Diego County APCD | Air Compressor | 120 | 1 |
| | Crane | 500 | 4 |
| | Crusher | 750 | 1 |
| | Grinder | 500 | 1 |
| | Other | 120 | 4 |
| | | 500 | 1 |
| | Turbine_Starter | 500 | 4 |
| San Joaquin Valley Unified APCD | Air Compressor | 120 | 2 |
| | | 500 | 1 |
| | Crusher | 120 | 2 |
| | | 175 | 2 |
| | | 250 | 1 |
| | | 500 | 7 |
| | | 750 | 1 |
| | Grinder | 500 | 9 |
| | | 750 | 1 |
| | | 1000 | 2 |
| | Other | 120 | 8 |
| | | 175 | 5 |
| | | 250 | 1 |
| South Coast AQMD | Crane | 120 | 4 |
| | | 175 | 11 |
| | | 250 | 19 |
| | | 500 | 5 |
| | Grinder | 120 | 1 |
| | | 250 | 3 |
| | | 500 | 7 |
| | | 750 | 3 |
| | Other | 120 | 22 |
| | | 175 | 6 |
| | | 250 | 2 |
| | | 500 | 3 |
| Ventura County APCD | Crane | 120 | 6 |
| | | 250 | 2 |
| | | 500 | 5 |
| | | 750 | 1 |
| | Crusher | 175 | 1 |
| | | 500 | 1 |
| | Other | 120 | 5 |
| | | 175 | 1 |
| | | **Grand Total** | **289** |

Source: District Survey by ARB Staff, August, 2003

Table 9

## Statewide Stationary Diesel Engine Population and Emissions 2002 Base Year

Revised September 10, 2003

| | | | Emissions (tons/day) | | | |
|---|---|---|---|---|---|---|
| **Equipment Type** | **Horsepower Class** | **Population** | **CO** | **NOx** | **PM** | **ROG** |
| Prime Generators | 25 to 50 | 19 | 0.0119 | 0.0100 | 0.0016 | 0.0048 |
| | 51 to 120 | 122 | 0.1050 | 0.2599 | 0.0257 | 0.0346 |
| | 121 to 175 | 76 | 0.0973 | 0.2631 | 0.0173 | 0.0259 |
| | 176 to 250 | 74 | 0.1203 | 0.3684 | 0.0217 | 0.0330 |
| | 251 to 500 | 182 | 0.4251 | 1.3389 | 0.0725 | 0.1123 |
| | 501 to 750 | 24 | 0.0932 | 0.2926 | 0.0159 | 0.0248 |
| | 751 to 1000 | 41 | 0.2867 | 0.8150 | 0.0410 | 0.0731 |
| | 1001 to 1500 | 41 | 0.3998 | 1.1365 | 0.0572 | 0.1020 |
| | 1501 to 2000 | 18 | 0.2422 | 0.6885 | 0.0346 | 0.0618 |
| | 2001 to 3000 | 29 | 0.5550 | 1.5775 | 0.0794 | 0.1416 |
| | 3000 or more | 1 | 0.0371 | 0.1054 | 0.0053 | 0.0095 |
| **Prime Generators Total** | | **627** | **2.3737** | **6.8560** | **0.3722** | **0.6234** |
| Prime Pumps | 25 to 50 | 12 | 0.0086 | 0.0073 | 0.0012 | 0.0035 |
| | 51 to 120 | 80 | 0.0684 | 0.1692 | 0.0168 | 0.0225 |
| | 121 to 175 | 50 | 0.0625 | 0.1690 | 0.0111 | 0.0167 |
| | 176 to 250 | 48 | 0.0742 | 0.2272 | 0.0134 | 0.0204 |
| | 251 to 500 | 119 | 0.2835 | 0.8929 | 0.0484 | 0.0749 |
| | 501 to 750 | 16 | 0.0607 | 0.1904 | 0.0103 | 0.0161 |
| | 751 to 1000 | 27 | 0.1866 | 0.5304 | 0.0267 | 0.0476 |
| | 1001 to 1500 | 27 | 0.2602 | 0.7396 | 0.0372 | 0.0664 |
| | 1501 to 2000 | 12 | 0.1576 | 0.4481 | 0.0225 | 0.0402 |
| | 2001 to 3000 | 19 | 0.3612 | 1.0266 | 0.0516 | 0.0921 |
| | 3000 or more | 1 | 0.0241 | 0.0686 | 0.0035 | 0.0062 |
| **Prime Pumps Total** | | **408** | **1.5476** | **4.4693** | **0.2426** | **0.4065** |
| Other | 25 to 50 | 1 | 0.0007 | 0.0006 | 0.0001 | 0.0003 |
| | 51 to 120 | 77 | 0.1039 | 0.2577 | 0.0248 | 0.0337 |
| | 121 to 175 | 40 | 0.0595 | 0.1611 | 0.0104 | 0.0158 |
| | 176 to 250 | 41 | 0.0888 | 0.2721 | 0.0159 | 0.0243 |
| | 251 to 500 | 80 | 0.2559 | 0.8067 | 0.0433 | 0.0673 |
| | 501 to 750 | 28 | 0.1083 | 0.3414 | 0.0180 | 0.0285 |
| | 751 to 1000 | 5 | 0.0302 | 0.0863 | 0.0043 | 0.0076 |
| | 1001 to 1500 | 7 | 0.0603 | 0.1723 | 0.0085 | 0.0151 |
| | 1501 to 2000 | 4 | 0.0414 | 0.1183 | 0.0059 | 0.0104 |
| | 2001 to 3000 | 6 | 0.0949 | 0.2710 | 0.0134 | 0.0237 |
| | 3000 or more | 0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| **Other Total** | | **289** | **0.8439** | **2.4876** | **0.1446** | **0.2266** |
| Backup Generators | 25 to 50 | 359 | 0.0040 | 0.0054 | 0.0006 | 0.0015 |
| | 51 to 120 | 2324 | 0.0541 | 0.1382 | 0.0102 | 0.0160 |
| | 121 to 175 | 1450 | 0.0511 | 0.1445 | 0.0074 | 0.0126 |
| | 176 to 250 | 1398 | 0.0649 | 0.2035 | 0.0095 | 0.0165 |
| | 251 to 500 | 3461 | 0.2392 | 0.7755 | 0.0348 | 0.0596 |
| | 501 to 750 | 460 | 0.0523 | 0.1691 | 0.0076 | 0.0131 |
| | 751 to 1000 | 777 | 0.1565 | 0.4645 | 0.0223 | 0.0379 |
| | 1001 to 1500 | 778 | 0.2182 | 0.6477 | 0.0310 | 0.0528 |
| | 1501 to 2000 | 338 | 0.1322 | 0.3924 | 0.0188 | 0.0320 |
| | 2001 to 3000 | 547 | 0.3029 | 0.8990 | 0.0431 | 0.0734 |
| | 3000 or more | 19 | 0.0202 | 0.0601 | 0.0029 | 0.0049 |
| **Backup Generators Total** | | **11909** | **1.2957** | **3.8998** | **0.1881** | **0.3202** |
| Backup Pumps | 25 to 50 | 234 | 0.0030 | 0.0039 | 0.0004 | 0.0011 |
| | 51 to 120 | 1512 | 0.0352 | 0.0900 | 0.0066 | 0.0104 |
| | 121 to 175 | 943 | 0.0328 | 0.0928 | 0.0048 | 0.0081 |
| | 176 to 250 | 909 | 0.0400 | 0.1255 | 0.0059 | 0.0101 |
| | 251 to 500 | 2253 | 0.1595 | 0.5172 | 0.0232 | 0.0397 |
| | 501 to 750 | 299 | 0.0340 | 0.1100 | 0.0050 | 0.0086 |
| | 751 to 1000 | 505 | 0.1018 | 0.3023 | 0.0145 | 0.0247 |
| | 1001 to 1500 | 506 | 0.1420 | 0.4215 | 0.0202 | 0.0344 |
| | 1501 to 2000 | 220 | 0.0860 | 0.2554 | 0.0122 | 0.0208 |
| | 2001 to 3000 | 356 | 0.1971 | 0.5850 | 0.0280 | 0.0477 |
| | 3000 or more | 12 | 0.0132 | 0.0391 | 0.0019 | 0.0032 |
| **Backup Pumps Total** | | **7750** | **0.8447** | **2.5426** | **0.1227** | **0.2088** |
| **Statewide Total** | | **20983** | **6.9056** | **20.2553** | **1.0702** | **1.7856** |

Table 10

Stationary Diesel Engine Population by District, 2002

Revised August 14, 2003

| District | Air Compressors | Prime Generators | Backup Generators | Prime Pumps | Backup Pumps | Other | Total |
|---|---|---|---|---|---|---|---|
| Amador County APCD | 0 | 1 | 12 | 0 | 8 | 0 | **21** |
| Antelope Valley APCD | 0 | 6 | 105 | 4 | 68 | 0 | **182** |
| Bay Area AQMD | 0 | 120 | 2285 | 78 | 1487 | 114 | **4084** |
| Butte County AQMD | 0 | 4 | 70 | 2 | 46 | 0 | **122** |
| Calaveras County AQMD | 0 | 1 | 14 | 0 | 9 | 0 | **25** |
| Colusa County APCD | 0 | 0 | 7 | 0 | 4 | 0 | **11** |
| El Dorado County APCD | 0 | 3 | 56 | 2 | 36 | 0 | **97** |
| Feather River AQMD | 0 | 3 | 49 | 2 | 32 | 0 | **85** |
| Glenn County APCD | 0 | 0 | 9 | 0 | 6 | 0 | **16** |
| Great Basin Unified APCD | 0 | 1 | 11 | 0 | 7 | 0 | **19** |
| Imperial County APCD | 0 | 3 | 51 | 2 | 33 | 0 | **89** |
| Kern County APCD | 0 | 2 | 40 | 1 | 26 | 0 | **69** |
| Lake County AQMD | 0 | 1 | 21 | 1 | 13 | 0 | **36** |
| Lassen County APCD | 0 | 1 | 12 | 0 | 7 | 0 | **20** |
| Mariposa County APCD | 0 | 0 | 6 | 0 | 4 | 0 | **10** |
| Mendocino County AQMD | 0 | 2 | 30 | 1 | 19 | 0 | **52** |
| Modoc County APCD | 0 | 0 | 3 | 0 | 2 | 0 | **5** |
| Mojave Desert AQMD | 0 | 7 | 142 | 5 | 92 | 0 | **246** |
| Monterey Bay Unified APCD | 1 | 13 | 245 | 8 | 160 | 0 | **427** |
| North Coast Unified APCD | 0 | 3 | 57 | 2 | 37 | 0 | **99** |
| Northern Sierra AQMD | 0 | 2 | 41 | 1 | 26 | 5 | **75** |
| Northern Sonoma County APCD | 0 | 1 | 20 | 1 | 13 | 0 | **34** |
| Placer County APCD | 0 | 5 | 91 | 3 | 59 | 1 | **160** |
| Sacramento Metropolitan AQMD | 0 | 23 | 438 | 15 | 285 | 2 | **763** |
| San Diego County APCD | 1 | 52 | 990 | 34 | 644 | 15 | **1737** |
| San Joaquin Valley Unified APCD | 3 | 60 | 1136 | 39 | 739 | 39 | **2016** |
| San Luis Obispo County APCD | 0 | 5 | 86 | 3 | 56 | 0 | **149** |
| Santa Barbara County APCD | 0 | 7 | 138 | 5 | 90 | 0 | **239** |
| Shasta County AQMD | 0 | 3 | 58 | 2 | 38 | 0 | **100** |
| Siskiyou County APCD | 0 | 1 | 15 | 1 | 10 | 0 | **26** |
| South Coast AQMD | 0 | 277 | 5268 | 180 | 3428 | 86 | **9239** |
| Tehama County APCD | 0 | 1 | 19 | 1 | 13 | 0 | **34** |
| Tuolumne County APCD | 0 | 1 | 19 | 1 | 12 | 0 | **33** |
| Ventura County APCD | 0 | 14 | 265 | 9 | 172 | 22 | **483** |
| Yolo/Solano AQMD | 0 | 5 | 103 | 4 | 67 | 0 | **178** |
| **Total** | **5** | **627** | **11909** | **408** | **7750** | **284** | **20983** |

Table 11

## Stationary Diesel Engines Emissions by District, 2002

Revised September 9, 2003

| District | Emissions (tons/day) | | | |
|---|---|---|---|---|
| | CO | $NO_x$ | PM | ROG |
| Amador County APCD | 0.0062 | 0.0183 | 0.0010 | 0.0016 |
| Antelope Valley APCD | 0.0534 | 0.1565 | 0.0082 | 0.0137 |
| Bay Area AQMD | 1.5569 | 4.5707 | 0.2385 | 0.4004 |
| Butte County AQMD | 0.0359 | 0.1051 | 0.0055 | 0.0092 |
| Calaveras County AQMD | 0.0073 | 0.0213 | 0.0011 | 0.0019 |
| Colusa County APCD | 0.0034 | 0.0098 | 0.0005 | 0.0009 |
| El Dorado County APCD | 0.0284 | 0.0831 | 0.0043 | 0.0073 |
| Feather River AQMD | 0.0249 | 0.0729 | 0.0038 | 0.0064 |
| Glenn County APCD | 0.0046 | 0.0135 | 0.0007 | 0.0012 |
| Great Basin Unified APCD | 0.0056 | 0.0165 | 0.0009 | 0.0014 |
| Imperial County APCD | 0.0261 | 0.0765 | 0.0040 | 0.0067 |
| Kern County APCD | 0.0203 | 0.0595 | 0.0031 | 0.0052 |
| Lake County AQMD | 0.0105 | 0.0308 | 0.0016 | 0.0027 |
| Lassen County APCD | 0.0059 | 0.0172 | 0.0009 | 0.0015 |
| Mariposa County APCD | 0.0030 | 0.0088 | 0.0005 | 0.0008 |
| Mendocino County AQMD | 0.0151 | 0.0442 | 0.0023 | 0.0039 |
| Modoc County APCD | 0.0016 | 0.0047 | 0.0002 | 0.0004 |
| Mojave Desert AQMD | 0.0722 | 0.2116 | 0.0110 | 0.0186 |
| Monterey Bay Unified APCD | 0.1275 | 0.3744 | 0.0195 | 0.0328 |
| North Coast Unified APCD | 0.0289 | 0.0848 | 0.0044 | 0.0074 |
| Northern Sierra AQMD | 0.0299 | 0.0863 | 0.0049 | 0.0080 |
| Northern Sonoma County APCD | 0.0100 | 0.0293 | 0.0015 | 0.0026 |
| Placer County APCD | 0.0466 | 0.1365 | 0.0071 | 0.0120 |
| Sacramento Metropolitan AQMD | 0.2276 | 0.6676 | 0.0349 | 0.0586 |
| San Diego County APCD | 0.5371 | 1.5774 | 0.0830 | 0.1388 |
| San Joaquin Valley Unified APCD | 0.7176 | 2.1107 | 0.1134 | 0.1868 |
| San Luis Obispo County APCD | 0.0437 | 0.1281 | 0.0067 | 0.0112 |
| Santa Barbara County APCD | 0.0700 | 0.2053 | 0.0107 | 0.0180 |
| Shasta County AQMD | 0.0294 | 0.0861 | 0.0045 | 0.0076 |
| Siskiyou County APCD | 0.0076 | 0.0223 | 0.0012 | 0.0020 |
| South Coast AQMD | 2.8953 | 8.4854 | 0.4495 | 0.7494 |
| Tehama County APCD | 0.0098 | 0.0288 | 0.0015 | 0.0025 |
| Tuolumne County APCD | 0.0097 | 0.0283 | 0.0015 | 0.0025 |
| Ventura County APCD | 0.1815 | 0.5298 | 0.0298 | 0.0481 |
| Yolo/Solano AQMD | 0.0523 | 0.1532 | 0.0080 | 0.0134 |
| **Total** | **6.9056** | **20.2553** | **1.0702** | **1.7856** |

Table 12

## Forecasted Stationary Diesel Emissions

| Pollutant | Equipment | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|
| CO | Prime Generators | 2.049 | 1.455 | 1.056 | 0.792 |
| | Prime Pumps | 1.336 | 0.949 | 0.688 | 0.517 |
| | Other | 0.298 | 0.227 | 0.179 | 0.154 |
| | Backup Generators | 1.198 | 1.018 | 0.904 | 0.847 |
| | Backup Pumps | 0.781 | 0.664 | 0.589 | 0.552 |
| **CO Total** | | **5.661** | **4.313** | **3.415** | **2.862** |
| NOx | Prime Generators | 6.243 | 4.709 | 3.579 | 2.694 |
| | Prime Pumps | 4.069 | 3.069 | 2.332 | 1.755 |
| | Other | 0.936 | 0.746 | 0.584 | 0.473 |
| | Backup Generators | 3.805 | 3.390 | 2.991 | 2.767 |
| | Backup Pumps | 2.481 | 2.210 | 1.950 | 1.804 |
| **NOx Total** | | **17.534** | **14.125** | **11.435** | **9.493** |
| PM | Prime Generators | 0.320 | 0.224 | 0.156 | 0.095 |
| | Prime Pumps | 0.209 | 0.146 | 0.102 | 0.062 |
| | Other | 0.050 | 0.037 | 0.027 | 0.018 |
| | Backup Generators | 0.175 | 0.144 | 0.118 | 0.091 |
| | Backup Pumps | 0.114 | 0.094 | 0.077 | 0.059 |
| **PM Total** | | **0.868** | **0.645** | **0.479** | **0.325** |
| ROG | Prime Generators | 0.555 | 0.396 | 0.282 | 0.202 |
| | Prime Pumps | 0.362 | 0.258 | 0.184 | 0.132 |
| | Other | 0.081 | 0.060 | 0.044 | 0.035 |
| | Backup Generators | 0.300 | 0.238 | 0.187 | 0.152 |
| | Backup Pumps | 0.195 | 0.155 | 0.122 | 0.099 |
| **ROG Total** | | **1.493** | **1.108** | **0.820** | **0.621** |

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**PREPARED BY**


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September 2003

## Attachment A
## California Population Distribution

| District | Air Basin | District | Air Basin | County | Population - 2002 | Percent of Statewide Population |
|---|---|---|---|---|---|---|
| Amador County APCD | Mountain Counties | Amador County APCD | Mountain Counties | Amador | 36,350 | 0.1% |
| Antelope Valley APCD | Mojave Desert | Antelope Valley APCD | Mojave Desert | Los Angeles | 310,900 | 0.9% |
| Bay Area AQMD | San Francisco Bay Area | Bay Area AQMD | San Francisco Bay Area | Alameda | 1,490,000 | 4.2% |
| | | Bay Area AQMD | San Francisco Bay Area | Contra Costa | 987,000 | 2.8% |
| | | Bay Area AQMD | San Francisco Bay Area | Marin | 249,100 | 0.7% |
| | | Bay Area AQMD | San Francisco Bay Area | Napa | 128,900 | 0.4% |
| | | Bay Area AQMD | San Francisco Bay Area | San Francisco | 789,800 | 2.2% |
| | | Bay Area AQMD | San Francisco Bay Area | San Mateo | 713,800 | 2.0% |
| | | Bay Area AQMD | San Francisco Bay Area | Santa Clara | 1,718,500 | 4.9% |
| | | Bay Area AQMD | San Francisco Bay Area | Solano | 283,300 | 0.8% |
| | | Bay Area AQMD | San Francisco Bay Area | Sonoma | 412,000 | 1.2% |
| Butte County AQMD | Sacramento Valley | Butte County AQMD | Sacramento Valley | Butte | 208,800 | 0.6% |
| Calaveras County AQMD | Mountain Counties | Calaveras County AQMD | Mountain Counties | Calaveras | 42,250 | 0.1% |
| Colusa County APCD | Sacramento Valley | Colusa County APCD | Sacramento Valley | Colusa | 19,550 | 0.1% |
| El Dorado County APCD | Lake Tahoe | El Dorado County APCD | Lake Tahoe | El Dorado | 36,000 | 0.1% |
| | Mountain Counties | El Dorado County APCD | Mountain Counties | El Dorado | 129,200 | 0.4% |
| Feather River AQMD | Sacramento Valley | Feather River AQMD | Sacramento Valley | Sutter | 82,500 | 0.2% |
| | | Feather River AQMD | Sacramento Valley | Yuba | 62,400 | 0.2% |
| Glenn County APCD | | Glenn County APCD | Sacramento Valley | Glenn | 26,850 | 0.1% |
| Great Basin Unified APCD | Great Basin Valleys | Great Basin Unified APCD | Great Basin Valleys | Alpine | 1,230 | 0.0% |
| | | Great Basin Unified APCD | Great Basin Valleys | Inyo | 18,250 | 0.1% |
| | | Great Basin Unified APCD | Great Basin Valleys | Mono | 13,350 | 0.0% |
| Imperial County APCD | Salton Sea | Imperial County APCD | Salton Sea | Imperial | 151,900 | 0.4% |
| Kern County APCD | Mojave Desert | Kern County APCD | Mojave Desert | Kern | 118,200 | 0.3% |
| Lake County AQMD | Lake County | Lake County AQMD | Lake County | Lake | 61,100 | 0.2% |
| Lassen County APCD | Northeast Plateau | Lassen County APCD | Northeast Plateau | Lassen | 34,150 | 0.1% |
| Mariposa County APCD | Mountain Counties | Mariposa County APCD | Mountain Counties | Mariposa | 17,400 | 0.0% |

## Attachment A
## California Population Distribution

| District | Air Basin | District | Air Basin | County | Population - 2002 | Percent Statewide Population |
|---|---|---|---|---|---|---|
| Mendocino County AQMD | North Coast | Mendocino County AQMD | North Coast | Mendocino | 87,900 | 0.2% |
| Modoc County APCD | Northeast Plateau | Modoc County APCD | Northeast Plateau | Modoc | 9,300 | 0.0% |
| Mojave Desert AQMD | Mojave Desert | Mojave Desert AQMD | Mojave Desert | Riverside | 17,800 | 0.1% |
| | | Mojave Desert AQMD | Mojave Desert | San Bernardino | 402,700 | 1.1% |
| Monterey Bay Unified APCD | North Central Coast | Monterey Bay Unified APCD | North Central Coast | Monterey | 412,000 | 1.2% |
| | | Monterey Bay Unified APCD | North Central Coast | San Benito | 56,000 | 0.2% |
| | | Monterey Bay Unified APCD | North Central Coast | Santa Cruz | 259,000 | 0.7% |
| North Coast Unified APCD | North Coast | North Coast Unified APCD | North Coast | Del Norte | 27,850 | 0.1% |
| | | North Coast Unified APCD | North Coast | Humboldt | 127,500 | 0.4% |
| | | North Coast Unified APCD | North Coast | Trinity | 13,100 | 0.0% |
| Northern Sierra AQMD | Mountain Counties | Northern Sierra AQMD | Mountain Counties | Nevada | 95,700 | 0.3% |
| | | Northern Sierra AQMD | Mountain Counties | Plumas | 20,950 | 0.1% |
| | | Northern Sierra AQMD | Mountain Counties | Sierra | 3,520 | 0.0% |
| Northern Sonoma County APCD | North Coast | Northern Sonoma County APCD | North Coast | Sonoma | 58,200 | 0.2% |
| Placer County APCD | Lake Tahoe | Placer County APCD | Lake Tahoe | Placer | 13,200 | 0.0% |
| | Mountain Counties | Placer County APCD | Mountain Counties | Placer | 24,100 | 0.1% |
| | Sacramento Valley | Placer County APCD | Sacramento Valley | Placer | 233,400 | 0.7% |
| Sacramento Metropolitan AQMD | | Sacramento Metropolitan AQMD | Sacramento Valley | Sacramento | 1,297,600 | 3.7% |
| San Diego County APCD | San Diego | San Diego County APCD | San Diego | San Diego | 2,935,100 | 8.3% |
| San Joaquin Valley Unified APCD | San Joaquin Valley | San Joaquin Valley Unified APCD | San Joaquin Valley | Fresno | 835,400 | 2.4% |
| | | San Joaquin Valley Unified APCD | San Joaquin Valley | Kern | 578,900 | 1.6% |
| | | San Joaquin Valley Unified APCD | San Joaquin Valley | Kings | 134,700 | 0.4% |
| | | San Joaquin Valley Unified APCD | San Joaquin Valley | Madera | 131,800 | 0.4% |
| | | San Joaquin Valley Unified APCD | San Joaquin Valley | Merced | 222,700 | 0.6% |
| | | San Joaquin Valley Unified APCD | San Joaquin Valley | San Joaquin | 605,500 | 1.7% |
| | | San Joaquin Valley Unified APCD | San Joaquin Valley | Stanislaus | 477,100 | 1.4% |

## Attachment A
## California Population Distribution

| District | Air Basin | District | Air Basin | County | Population - 2002 | Percent of Statewide Population |
|---|---|---|---|---|---|---|
| | | San Joaquin Valley Unified APCD | San Joaquin Valley | Tulare | 382,000 | 1.1% |
| San Luis Obispo County APCD | South Central Coast | San Luis Obispo County APCD | South Central Coast | San Luis Obispo | 254,500 | 0.7% |
| Santa Barbara County APCD | | Santa Barbara County APCD | South Central Coast | Santa Barbara | 407,800 | 1.2% |
| Shasta County AQMD | Sacramento Valley | Shasta County AQMD | Sacramento Valley | Shasta | 171,100 | 0.5% |
| Siskiyou County APCD | Northeast Plateau | Siskiyou County APCD | Northeast Plateau | Siskiyou | 44,300 | 0.1% |
| South Coast AQMD | Mojave Desert | South Coast AQMD | Mojave Desert | Riverside | 10,100 | 0.0% |
| | Salton Sea | South Coast AQMD | Salton Sea | Riverside | 351,000 | 1.0% |
| | South Coast | South Coast AQMD | South Coast | Los Angeles | 9,591,800 | 27.2% |
| | | South Coast AQMD | South Coast | Orange | 2,954,500 | 8.4% |
| | | South Coast AQMD | South Coast | Riverside | 1,298,100 | 3.7% |
| | | South Coast AQMD | South Coast | San Bernardino | 1,409,000 | 4.0% |
| Tehama County APCD | Sacramento Valley | Tehama County APCD | Sacramento Valley | Tehama | 57,300 | 0.2% |
| Tuolumne County APCD | Mountain Counties | Tuolumne County APCD | Mountain Counties | Tuolumne | 56,200 | 0.2% |
| Ventura County APCD | South Central Coast | Ventura County APCD | South Central Coast | Ventura | 785,700 | 2.2% |
| Yolo/Solano AQMD | Sacramento Valley | Yolo/Solano AQMD | Sacramento Valley | Solano | 125,400 | 0.4% |
| | | Yolo/Solano AQMD | Sacramento Valley | Yolo | 179,000 | 0.5% |
| **Statewide Total** | | | | | **35,301,600** | **100%** |

Source: California Department of Finance, 2002 (see reference 12)

## Attachment B
## Age Distribution of Stationary Diesel Commercial Engines

| Year | Age | % Prime | % Backup |
|---|---|---|---|
| 2002 | 0 | 3.55 | 2.99 |
| 2001 | 1 | 7.01 | 5.91 |
| 2000 | 2 | 7.36 | 6.20 |
| 1999 | 3 | 7.72 | 6.50 |
| 1998 | 4 | 7.63 | 6.43 |
| 1997 | 5 | 7.54 | 6.36 |
| 1996 | 6 | 7.42 | 6.25 |
| 1995 | 7 | 6.69 | 5.63 |
| 1994 | 8 | 5.16 | 4.35 |
| 1993 | 9 | 3.59 | 3.03 |
| 1992 | 10 | 2.88 | 2.43 |
| 1991 | 11 | 2.89 | 2.44 |
| 1990 | 12 | 3.84 | 3.24 |
| 1989 | 13 | 4.71 | 3.97 |
| 1988 | 14 | 4.47 | 3.77 |
| 1987 | 15 | 4.12 | 3.47 |
| 1986 | 16 | 2.94 | 2.48 |
| 1985 | 17 | 1.76 | 1.49 |
| 1984 | 18 | 1.41 | 1.19 |
| 1983 | 19 | 1.18 | 0.99 |
| 1982 | 20 | 1.06 | 0.89 |
| 1981 | 21 | 1.00 | 0.88 |
| 1980 | 22 | 0.94 | 0.86 |
| 1979 | 23 | 0.71 | 0.85 |
| 1978 | 24 | 0.59 | 0.83 |
| 1977 | 25 | 0.53 | 0.82 |
| 1976 | 26 | 0.41 | 0.81 |
| 1975 | 27 | 0.29 | 0.79 |
| 1974 | 28 | 0.24 | 0.78 |
| 1973 | 29 | 0.16 | 0.76 |
| 1972 | 30 | 0.10 | 0.75 |
| 1971 | 31 | 0.06 | 0.73 |
| 1970 | 32 | 0.03 | 0.72 |
| 1969 | 33 | | 0.70 |
| 1968 | 34 | | 0.69 |
| 1967 | 35 | | 0.67 |
| 1966 | 36 | | 0.66 |
| 1965 | 37 | | 0.65 |
| 1964 | 38 | | 0.63 |
| 1963 | 39 | | 0.62 |
| 1962 | 40 | | 0.60 |
| 1961 | 41 | | 0.59 |
| 1960 | 42 | | 0.57 |
| 1959 | 43 | | 0.56 |

## Attachment B

## Age Distribution of Stationary Diesel Commercial Engines

| Year | Age | % Prime | % Backup |
|---|---|---|---|
| 1958 | 44 | | 0.54 |
| 1957 | 45 | | 0.53 |
| 1956 | 46 | | 0.51 |
| 1955 | 47 | | 0.50 |
| 1954 | 48 | | 0.49 |
| 1953 | 49 | | 0.47 |
| 1952 | 50 | | 0.46 |

Source: OFFROAD Model Documentation(Prime) and District Permit Data (Backup)

## Attachment C
## Stationary Diesel Engine Operating Assumptions

Revised August 14, 2003

| Equipment | Horsepower | Average Horsepower | Activity(hrs/year) | Load Factor |
|---|---|---|---|---|
| | | $HP_{et}$ | $Activity_{et,hp}$ | $Lf_{et,hp}$ |
| Air Compressors | 25-50 | 37 | 815 | 0.48 |
| | 51-120 | 78 | 815 | 0.48 |
| | 121-175 | 147 | 815 | 0.48 |
| | 176-250 | 218 | 815 | 0.48 |
| | 251-500 | 385 | 815 | 0.48 |
| | 501-750 | 595 | 815 | 0.48 |
| | 750-1000 | 889 | 815 | 0.48 |
| | 1000-1500 | 1238 | 815 | 0.48 |
| | 1500-2000 | 1726 | 815 | 0.48 |
| | 2000-3000 | 2444 | 815 | 0.48 |
| | >3000 | 4726 | 815 | 0.48 |
| Prime Generators | 25-50 | 33 | 953 | 0.74 |
| | 51-120 | 84 | 953 | 0.74 |
| | 121-175 | 153 | 953 | 0.74 |
| | 176-250 | 229 | 953 | 0.74 |
| | 251-500 | 363 | 953 | 0.74 |
| | 501-750 | 586 | 953 | 0.74 |
| | 750-1000 | 889 | 953 | 0.74 |
| | 1000-1500 | 1238 | 953 | 0.74 |
| | 1500-2000 | 1726 | 953 | 0.74 |
| | 2000-3000 | 2444 | 953 | 0.74 |
| | >3000 | 4726 | 953 | 0.74 |
| Backup Generators | 25-50 | 33 | 30 | 0.74 |
| | 51-120 | 84 | 30 | 0.74 |
| | 121-175 | 153 | 30 | 0.74 |
| | 176-250 | 229 | 30 | 0.74 |
| | 251-500 | 363 | 30 | 0.74 |
| | 501-750 | 586 | 30 | 0.74 |
| | 750-1000 | 889 | 30 | 0.74 |
| | 1000-1500 | 1238 | 30 | 0.74 |
| | 1500-2000 | 1726 | 30 | 0.74 |
| | 2000-3000 | 2444 | 30 | 0.74 |
| | >3000 | 4726 | 30 | 0.74 |
| Prime Pumps | 25-50 | 37 | 953 | 0.74 |
| | 51-120 | 84 | 953 | 0.74 |
| | 121-175 | 151 | 953 | 0.74 |
| | 176-250 | 217 | 953 | 0.74 |
| | 251-500 | 372 | 953 | 0.74 |
| | 501-750 | 586 | 953 | 0.74 |
| | 750-1000 | 889 | 953 | 0.74 |
| | 1000-1500 | 1238 | 953 | 0.74 |
| | 1500-2000 | 1726 | 953 | 0.74 |
| | 2000-3000 | 2444 | 953 | 0.74 |
| | >3000 | 4726 | 953 | 0.74 |
| Backup Pumps | 25-50 | 37 | 30 | 0.74 |
| | 51-120 | 84 | 30 | 0.74 |
| | 121-175 | 151 | 30 | 0.74 |

## Attachment C
## Stationary Diesel Engine Operating Assumptions

Revised August 14, 2003

| Equipment | Horsepower | Average Horsepower | Activity(hrs/year) | Load Factor |
|---|---|---|---|---|
| | | $HP_{et}$ | $Activity_{et, hp}$ | $Lf_{et,hp}$ |
| | 176-250 | 217 | 30 | 0.74 |
| | 251-500 | 372 | 30 | 0.74 |
| | 501-750 | 586 | 30 | 0.74 |
| | 750-1000 | 889 | 30 | 0.74 |
| | 1000-1500 | 1238 | 30 | 0.74 |
| | 1500-2000 | 1726 | 30 | 0.74 |
| | 2000-3000 | 2444 | 30 | 0.74 |
| | >3000 | 4726 | 30 | 0.74 |
| Other | 25-50 | 42 | 394 | 0.375 |
| | 51-120 | 67 | 394 | 0.375 |
| | 121-175 | 162.5 | 394 | 0.375 |
| | 176-250 | 218 | 394 | 0.375 |
| | 251-500 | 385 | 394 | 0.375 |
| | 501-750 | 595 | 394 | 0.375 |
| | 750-1000 | 889 | 394 | 0.375 |
| | 1000-1500 | 1238 | 394 | 0.375 |
| | 1500-2000 | 1726 | 394 | 0.375 |
| | 2000-3000 | 2444 | 394 | 0.375 |
| | >3000 | 4726 | 394 | 0.375 |
| Crane | 50 | 42 | 1024 | 0.32 |
| | 120 | 109 | 1024 | 0.32 |
| | 175 | 150 | 1024 | 0.32 |
| | 250 | 202 | 1024 | 0.32 |
| | 500 | 354 | 1024 | 0.32 |
| | 750 | 545 | 1024 | 0.32 |
| | 1000 | 889 | 1024 | 0.32 |
| | 1500 | 1238 | 1024 | 0.32 |
| | 2000 | 1726 | 1024 | 0.32 |
| | 3000 | 2444 | 1024 | 0.32 |
| | 10000 | 4726 | 1024 | 0.32 |
| Crusher | 50 | 42 | 1226 | 0.44 |
| | 120 | 105 | 1226 | 0.44 |
| | 175 | 148 | 1226 | 0.44 |
| | 250 | 180 | 1226 | 0.44 |
| | 500 | 390 | 1226 | 0.44 |
| | 750 | 695 | 1226 | 0.44 |
| | 1000 | 889 | 1226 | 0.44 |
| | 1500 | 1238 | 1226 | 0.44 |
| | 2000 | 1726 | 1226 | 0.44 |
| | 3000 | 2444 | 1226 | 0.44 |
| | 10000 | 4726 | 1226 | 0.44 |
| Grinder | 50 | 42 | 798 | 0.4 |
| | 120 | 82 | 798 | 0.4 |
| | 175 | 163 | 798 | 0.4 |
| | 250 | 230 | 798 | 0.4 |
| | 500 | 393 | 798 | 0.4 |
| | 750 | 582 | 798 | 0.4 |
| | 1000 | 800 | 798 | 0.4 |

## Attachment C
## Stationary Diesel Engine Operating Assumptions

Revised August 14, 2003

| Equipment | Horsepower | Average Horsepower | Activity(hrs/year) | Load Factor |
|---|---|---|---|---|
| | | $HP_{et}$ | $Activity_{et,hp}$ | $Lf_{et,hp}$ |
| | 1500 | 1238 | 798 | 0.4 |
| | 2000 | 1726 | 798 | 0.4 |
| | 3000 | 2444 | 798 | 0.4 |
| | 10000 | 4726 | 798 | 0.4 |
| Other | 50 | 46 | 735 | 0.42 |
| | 120 | 93 | 735 | 0.42 |
| | 175 | 146 | 735 | 0.42 |
| | 250 | 221 | 735 | 0.42 |
| | 500 | 374 | 735 | 0.42 |
| | 750 | 659 | 735 | 0.42 |
| | 1000 | 950 | 735 | 0.42 |
| | 1500 | 1288 | 735 | 0.42 |
| | 2000 | 1547 | 735 | 0.42 |
| | 3000 | 2363 | 735 | 0.42 |
| | 10000 | 4726 | 735 | 0.42 |
| Turbine_Starter | 50 | 42 | 23 | 0.8 |
| | 120 | 67 | 23 | 0.8 |
| | 175 | 163 | 23 | 0.8 |
| | 250 | 218 | 23 | 0.8 |
| | 500 | 313 | 23 | 0.8 |
| | 750 | 595 | 23 | 0.8 |
| | 1000 | 889 | 23 | 0.8 |
| | 1500 | 1238 | 23 | 0.8 |
| | 2000 | 1726 | 23 | 0.8 |
| | 3000 | 2444 | 23 | 0.8 |
| | 10000 | 4726 | 23 | 0.8 |
| | | | | |

Source: Power Systems Research (PSR) 1996 Database and District Permit Survey Data

## Attachment D
## Emission Factors Used in OFFROAD Model

Key: ZH = Zero Hour($ZH_{et,hp,my,pol}$); det = Deterioration Rate($DR_{et,hp,my,pol}$)

| HP | Year | ROG ZH | ROG det | CO ZH | CO det | NOx ZH | NOx det | PM ZH | PM det |
|---|---|---|---|---|---|---|---|---|---|
| | | (g/hp-hr) | (g/hp-hr2) | (g/hp-hr) | (g/hp-hr2) | (g/hp-hr) | (g/hp-hr2) | (g/hp-hr) | (g/hp-hr2) |
| 25-50 | 1970-1987 | 1.84 | 2.35E-04 | 5.00 | 5.13E-04 | 6.90 | 1.04E-04 | 0.76 | 5.89E-05 |
| 25-50 | 1988-1998 | 1.80 | 2.30E-04 | 5.00 | 5.13E-04 | 6.90 | 1.04E-04 | 0.76 | 5.89E-05 |
| 25-50 | 1999-2003 | 1.45 | 1.85E-04 | 4.10 | 4.20E-04 | 5.55 | 1.03E-04 | 0.60 | 4.65E-05 |
| 25-50 | 2004 | 0.64 | 9.80E-05 | 3.27 | 3.34E-04 | 5.10 | 9.33E-05 | 0.43 | 3.36E-05 |
| 25-50 | 2005 | 0.37 | 6.90E-05 | 3.00 | 3.05E-04 | 4.95 | 9.67E-05 | 0.38 | 2.93E-05 |
| 25-50 | 2006-2007 | 0.24 | 5.45E-05 | 2.86 | 2.90E-04 | 4.88 | 9.83E-05 | 0.35 | 2.72E-05 |
| 25-50 | 2008-2020 | 0.10 | 4.00E-05 | 2.72 | 2.76E-04 | 4.80 | 1.00E-04 | 0.32 | 2.50E-05 |
| 51-120 | 1970-1987 | 1.44 | 6.66E-05 | 4.80 | 1.27E-04 | 13.00 | 3.01E-04 | 0.84 | 6.11E-05 |
| 51-120 | 1988-1997 | 0.99 | 4.58E-05 | 3.49 | 9.23E-05 | 8.75 | 2.02E-04 | 0.69 | 5.02E-05 |
| 51-120 | 1998-2003 | 0.99 | 4.58E-05 | 3.49 | 9.23E-05 | 6.90 | 1.60E-04 | 0.69 | 5.02E-05 |
| 51-120 | 2004 | 0.46 | 3.33E-05 | 3.23 | 8.55E-05 | 5.64 | 1.03E-04 | 0.39 | 2.85E-05 |
| 51-120 | 2005 | 0.28 | 2.92E-05 | 3.14 | 8.33E-05 | 5.22 | 8.40E-05 | 0.29 | 2.12E-05 |
| 51-120 | 2006-2007 | 0.19 | 2.71E-05 | 3.09 | 8.21E-05 | 5.01 | 7.45E-05 | 0.28 | 1.76E-05 |
| 51-120 | 2008-2020 | 0.10 | 2.50E-05 | 3.05 | 8.10E-05 | 2.89 | 3.80E-05 | 0.28 | 1.40E-05 |
| 121-175 | 1969 | 1.32 | 6.11E-05 | 4.40 | 1.16E-04 | 14.00 | 3.24E-04 | 0.77 | 5.60E-05 |
| 121-175 | 1970-1971 | 1.10 | 5.09E-05 | 4.40 | 1.16E-04 | 13.00 | 3.01E-04 | 0.66 | 4.80E-05 |
| 121-175 | 1972-1979 | 1.00 | 4.63E-05 | 4.40 | 1.16E-04 | 12.00 | 2.78E-04 | 0.55 | 4.00E-05 |
| 121-175 | 1980-1984 | 0.94 | 4.35E-05 | 4.30 | 1.14E-04 | 11.00 | 2.54E-04 | 0.55 | 4.00E-05 |
| 121-175 | 1985-1987 | 0.88 | 4.07E-05 | 4.20 | 1.11E-04 | 11.00 | 2.54E-04 | 0.55 | 4.00E-05 |
| 121-175 | 1988-1996 | 0.68 | 3.15E-05 | 2.70 | 7.14E-05 | 8.17 | 1.89E-04 | 0.38 | 2.76E-05 |
| 121-175 | 1997-2002 | 0.68 | 3.15E-05 | 2.70 | 7.14E-05 | 6.90 | 1.60E-04 | 0.38 | 2.76E-05 |
| 121-175 | 2003 | 0.33 | 2.79E-05 | 2.70 | 7.14E-05 | 5.26 | 9.64E-05 | 0.28 | 1.70E-05 |
| 121-175 | 2004 | 0.22 | 2.63E-05 | 2.70 | 7.14E-05 | 4.72 | 7.52E-05 | 0.28 | 1.35E-05 |
| 121-175 | 2005-2006 | 0.16 | 2.57E-05 | 2.70 | 7.14E-05 | 4.44 | 6.46E-05 | 0.28 | 1.18E-05 |
| 121-175 | 2007-2020 | 0.10 | 2.50E-05 | 2.70 | 7.14E-05 | 2.45 | 2.45E-05 | 0.28 | 1.00E-05 |
| 176-250 | 1969 | 1.32 | 6.11E-05 | 4.40 | 1.16E-04 | 14.00 | 3.24E-04 | 0.77 | 5.60E-05 |
| 176-250 | 1970-1971 | 1.10 | 5.09E-05 | 4.40 | 1.16E-04 | 13.00 | 3.01E-04 | 0.66 | 4.80E-05 |
| 176-250 | 1972-1979 | 1.00 | 4.63E-05 | 4.40 | 1.16E-04 | 12.00 | 2.78E-04 | 0.55 | 4.00E-05 |
| 176-250 | 1980-1984 | 0.94 | 4.35E-05 | 4.30 | 1.14E-04 | 11.00 | 2.54E-04 | 0.55 | 4.00E-05 |
| 176-250 | 1985-1987 | 0.88 | 4.07E-05 | 4.20 | 1.11E-04 | 11.00 | 2.54E-04 | 0.55 | 4.00E-05 |
| 176-250 | 1988-1995 | 0.68 | 3.15E-05 | 2.70 | 7.14E-05 | 8.17 | 1.89E-04 | 0.38 | 2.76E-05 |
| 176-250 | 1996-2002 | 0.32 | 1.48E-05 | 0.92 | 2.43E-05 | 6.25 | 1.45E-04 | 0.28 | 7.96E-06 |
| 176-250 | 2003 | 0.19 | 2.09E-05 | 0.92 | 2.43E-05 | 5.00 | 9.05E-05 | 0.28 | 6.51E-06 |
| 176-250 | 2004 | 0.14 | 2.30E-05 | 0.92 | 2.43E-05 | 4.58 | 7.23E-05 | 0.28 | 6.03E-06 |
| 176-250 | 2005-2006 | 0.12 | 2.40E-05 | 0.92 | 2.43E-05 | 4.38 | 6.33E-05 | 0.28 | 5.79E-06 |
| 176-250 | 2007-2020 | 0.10 | 2.50E-05 | 0.92 | 2.43E-05 | 2.45 | 3.18E-05 | 0.28 | 5.59E-06 |
| 251-500 | 1969 | 1.26 | 4.39E-05 | 4.20 | 8.32E-05 | 14.00 | 2.33E-04 | 0.74 | 3.93E-05 |
| 251-500 | 1970-1971 | 1.05 | 3.66E-05 | 4.20 | 8.32E-05 | 13.00 | 2.16E-04 | 0.63 | 3.34E-05 |
| 251-500 | 1972-1979 | 0.95 | 3.31E-05 | 4.20 | 8.32E-05 | 12.00 | 2.00E-04 | 0.53 | 2.81E-05 |
| 251-500 | 1980-1984 | 0.90 | 3.14E-05 | 4.20 | 8.32E-05 | 11.00 | 1.83E-04 | 0.53 | 2.81E-05 |
| 251-500 | 1985-1987 | 0.84 | 2.93E-05 | 4.10 | 8.12E-05 | 11.00 | 1.83E-04 | 0.53 | 2.81E-05 |
| 251-500 | 1988-1995 | 0.68 | 2.37E-05 | 2.70 | 5.35E-05 | 8.17 | 1.36E-04 | 0.38 | 2.02E-05 |
| 251-500 | 1996-2000 | 0.32 | 1.12E-05 | 0.92 | 1.82E-05 | 6.25 | 1.04E-04 | 0.28 | 7.96E-06 |
| 251-500 | 2001 | 0.19 | 1.95E-05 | 0.92 | 1.82E-05 | 4.95 | 7.34E-05 | 0.28 | 6.51E-06 |
| 251-500 | 2002 | 0.14 | 2.22E-05 | 0.92 | 1.82E-05 | 4.51 | 6.32E-05 | 0.28 | 6.03E-06 |
| 251-500 | 2003-2004 | 0.12 | 2.36E-05 | 0.92 | 1.82E-05 | 4.29 | 5.81E-05 | 0.28 | 5.79E-06 |
| 251-500 | 2005 | 0.10 | 2.50E-05 | 0.92 | 1.82E-05 | 4.00 | 5.30E-05 | 0.28 | 5.55E-06 |

## Attachment D
## Emission Factors Used in OFFROAD Model

Key: ZH = Zero Hour($ZH_{et,hp,my,pol}$); det = Deterioration Rate($DR_{et,hp,my,pol}$)

| HP | Year | ROG ZH | ROG det | CO ZH | CO det | NOx ZH | NOx det | PM ZH | PM det |
|---|---|---|---|---|---|---|---|---|---|
| | | (g/hp-hr) | (g/hp-hr2) | (g/hp-hr) | (g/hp-hr2) | (g/hp-hr) | (g/hp-hr2) | (g/hp-hr) | (g/hp-hr2) |
| 251-500 | 2006-2020 | 0.10 | 2.50E-05 | 0.92 | 1.82E-05 | 2.45 | 3.18E-05 | 0.28 | 5.55E-06 |
| 501-750 | 1969 | 1.26 | 4.39E-05 | 4.20 | 8.32E-05 | 14.00 | 2.33E-04 | 0.74 | 3.93E-05 |
| 501-750 | 1970-1971 | 1.05 | 3.66E-05 | 4.20 | 8.32E-05 | 13.00 | 2.16E-04 | 0.63 | 3.34E-05 |
| 501-750 | 1972-1979 | 0.95 | 3.31E-05 | 4.20 | 8.32E-05 | 12.00 | 2.00E-04 | 0.53 | 2.81E-05 |
| 501-750 | 1980-1984 | 0.90 | 3.14E-05 | 4.20 | 8.32E-05 | 11.00 | 1.83E-04 | 0.53 | 2.81E-05 |
| 501-750 | 1985-1987 | 0.84 | 2.93E-05 | 4.10 | 8.12E-05 | 11.00 | 1.83E-04 | 0.53 | 2.81E-05 |
| 501-750 | 1988-1995 | 0.68 | 2.37E-05 | 2.70 | 5.35E-05 | 8.17 | 1.36E-04 | 0.38 | 2.02E-05 |
| 501-750 | 1996-2001 | 0.32 | 1.12E-05 | 0.92 | 1.82E-05 | 6.25 | 1.04E-04 | 0.28 | 7.96E-06 |
| 501-750 | 2002 | 0.19 | 1.95E-05 | 0.92 | 1.82E-05 | 4.95 | 7.34E-05 | 0.28 | 6.51E-06 |
| 501-750 | 2003 | 0.14 | 2.22E-05 | 0.92 | 1.82E-05 | 4.51 | 6.32E-05 | 0.28 | 6.03E-06 |
| 501-750 | 2004-2005 | 0.12 | 2.36E-05 | 0.92 | 1.82E-05 | 4.29 | 5.81E-05 | 0.28 | 5.79E-06 |
| 501-750 | 2006-2020 | 0.10 | 2.50E-05 | 0.92 | 1.82E-05 | 2.45 | 3.18E-05 | 0.28 | 5.55E-06 |
| >751 | 1969 | 1.26 | 4.39E-05 | 4.20 | 8.32E-05 | 14.00 | 2.33E-04 | 0.74 | 3.93E-05 |
| >751 | 1970-1971 | 1.05 | 3.66E-05 | 4.20 | 8.32E-05 | 13.00 | 2.16E-04 | 0.63 | 3.34E-05 |
| >751 | 1972-1979 | 0.95 | 3.31E-05 | 4.20 | 8.32E-05 | 12.00 | 2.00E-04 | 0.53 | 2.81E-05 |
| >751 | 1980-1984 | 0.90 | 3.14E-05 | 4.20 | 8.32E-05 | 11.00 | 1.83E-04 | 0.53 | 2.81E-05 |
| >751 | 1985-1987 | 0.84 | 2.93E-05 | 4.10 | 8.12E-05 | 11.00 | 1.83E-04 | 0.53 | 2.81E-05 |
| >751 | 1988-1999 | 0.68 | 2.37E-05 | 2.70 | 5.35E-05 | 8.17 | 1.36E-04 | 0.38 | 2.02E-06 |
| >751 | 2000-2005 | 0.32 | 1.12E-05 | 0.92 | 1.82E-05 | 6.25 | 1.04E-04 | 0.28 | 7.96E-06 |
| >751 | 2006 | 0.19 | 1.95E-05 | 0.92 | 1.82E-05 | 4.95 | 7.34E-05 | 0.28 | 6.51E-06 |
| >751 | 2007 | 0.14 | 2.22E-05 | 0.92 | 1.82E-05 | 4.51 | 6.32E-05 | 0.28 | 6.03E-06 |
| >751 | 2008-2009 | 0.12 | 2.36E-05 | 0.92 | 1.82E-05 | 4.29 | 5.81E-05 | 0.28 | 5.79E-06 |
| >751 | 2010-2020 | 0.10 | 2.50E-05 | 0.92 | 1.82E-05 | 4.08 | 5.30E-05 | 0.28 | 5.55E-06 |
| Source: ARB OFFROAD Model | | | | | | | | | |
| Note: ZH means Zero-Hour, det means deterioration rate | | | | | | | | | |
| | | 1.84 | 0.00 | 5.00 | 0.00 | 14.00 | 0.00 | 0.84 | 0.00 |
| | | 0.10 | 0.00 | 0.92 | 0.00 | 2.45 | 0.00 | 0.28 | 0.00 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

| Revised September 10, 2003, 2003 | | | | | | Emissions (tons/day) | | | |
|---|---|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
| Amador County APCD | Mountain Counties | Amador | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 500 | 0.2 | 0.0004 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 2.4 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 1.5 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 1.4 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 3.6 | 0.0002 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 750 | 0.5 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.8 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.8 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.3 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.6 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.6 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 1.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.9 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 2.3 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 750 | 0.3 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.5 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.5 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.4 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Amador County APCD Total | 0 | 0 | 0 | | 21.3 | 0.0062 | 0.0183 | 0.0010 | 0.0016 |
| Antelope Valley APCD | Mojave Desert | Los Angeles | Prime Generators | 50 | 0.2 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 120 | 1.1 | 0.0009 | 0.0023 | 0.0002 | 0.0003 |
| | | | | 175 | 0.7 | 0.0009 | 0.0023 | 0.0002 | 0.0002 |
| | | | | 250 | 0.6 | 0.0011 | 0.0032 | 0.0002 | 0.0003 |
| | | | | 500 | 1.6 | 0.0037 | 0.0118 | 0.0006 | 0.0010 |
| | | | | 750 | 0.2 | 0.0008 | 0.0026 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.4 | 0.0025 | 0.0072 | 0.0004 | 0.0006 |
| | | | | 1500 | 0.4 | 0.0035 | 0.0100 | 0.0005 | 0.0009 |
| | | | | 2000 | 0.2 | 0.0021 | 0.0061 | 0.0003 | 0.0005 |
| | | | | 3000 | 0.3 | 0.0049 | 0.0139 | 0.0007 | 0.0012 |
| | | | | 10000 | 0.0 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | Prime Pumps | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.7 | 0.0006 | 0.0015 | 0.0001 | 0.0002 |
| | | | | 175 | 0.4 | 0.0006 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 250 | 0.4 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 500 | 1.0 | 0.0025 | 0.0079 | 0.0004 | 0.0007 |
| | | | | 750 | 0.1 | 0.0005 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.2 | 0.0016 | 0.0047 | 0.0002 | 0.0004 |
| | | | | 1500 | 0.2 | 0.0023 | 0.0065 | 0.0003 | 0.0006 |
| | | | | 2000 | 0.1 | 0.0014 | 0.0039 | 0.0002 | 0.0004 |
| | | | | 3000 | 0.2 | 0.0032 | 0.0090 | 0.0005 | 0.0008 |
| | | | | 10000 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 3.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 20.5 | 0.0005 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 175 | 12.8 | 0.0005 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 250 | 12.3 | 0.0006 | 0.0018 | 0.0001 | 0.0001 |
| | | | | 500 | 30.5 | 0.0021 | 0.0068 | 0.0003 | 0.0005 |
| | | | | 750 | 4.1 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 1000 | 6.8 | 0.0014 | 0.0041 | 0.0002 | 0.0003 |
| | | | | 1500 | 6.8 | 0.0019 | 0.0057 | 0.0003 | 0.0005 |
| | | | | 2000 | 3.0 | 0.0012 | 0.0035 | 0.0002 | 0.0003 |
| | | | | 3000 | 4.8 | 0.0027 | 0.0079 | 0.0004 | 0.0006 |
| | | | | 10000 | 0.2 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 2.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 13.3 | 0.0003 | 0.0008 | 0.0001 | 0.0001 |
| | | | | 175 | 8.3 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 250 | 8.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 500 | 19.8 | 0.0014 | 0.0046 | 0.0002 | 0.0003 |
| | | | | 750 | 2.6 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 1000 | 4.5 | 0.0009 | 0.0027 | 0.0001 | 0.0002 |
| | | | | 1500 | 4.5 | 0.0013 | 0.0037 | 0.0002 | 0.0003 |
| | | | | 2000 | 1.9 | 0.0008 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 3000 | 3.1 | 0.0017 | 0.0052 | 0.0002 | 0.0004 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| Antelope Valley APCD Total | 0 | 0 | 0 | | 182.3 | 0.0534 | 0.1565 | 0.0082 | 0.0137 |
| Bay Area AQMD | San Francisco Bay Area | Alameda | Prime Generators | 50 | 0.8 | 0.0005 | 0.0004 | 0.0001 | 0.0002 |
| | | | | 120 | 5.2 | 0.0044 | 0.0110 | 0.0011 | [illegible] |
| | | | | 175 | 3.2 | 0.0041 | 0.0111 | 0.0007 | 0.0011 |
| | | | | 250 | 3.1 | 0.0051 | 0.0156 | 0.0009 | 0.0014 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 500 | 7.7 | 0.0179 | 0.0565 | 0.0031 | 0.0047 |
| | | | | 750 | 1.0 | 0.0039 | 0.0124 | 0.0007 | 0.0010 |
| | | | | 1000 | 1.7 | 0.0121 | 0.0344 | 0.0017 | 0.0031 |
| | | | | 1500 | 1.7 | 0.0169 | 0.0480 | 0.0024 | 0.0043 |
| | | | | 2000 | 0.8 | 0.0102 | 0.0291 | 0.0015 | 0.0026 |
| | | | | 3000 | 1.2 | 0.0234 | 0.0666 | 0.0033 | 0.0060 |
| | | | | 10000 | 0.0 | 0.0016 | 0.0044 | 0.0002 | 0.0004 |
| | | | Prime Pumps | 50 | 0.5 | 0.0004 | 0.0003 | 0.0000 | 0.0001 |
| | | | | 120 | 3.4 | 0.0029 | 0.0071 | 0.0007 | 0.0010 |
| | | | | 175 | 2.1 | 0.0026 | 0.0071 | 0.0005 | 0.0007 |
| | | | | 250 | 2.0 | 0.0031 | 0.0096 | 0.0006 | 0.0009 |
| | | | | 500 | 5.0 | 0.0120 | 0.0377 | 0.0020 | 0.0032 |
| | | | | 750 | 0.7 | 0.0026 | 0.0080 | 0.0004 | 0.0007 |
| | | | | 1000 | 1.1 | 0.0079 | 0.0224 | 0.0011 | 0.0020 |
| | | | | 1500 | 1.1 | 0.0110 | 0.0312 | 0.0016 | 0.0028 |
| | | | | 2000 | 0.5 | 0.0067 | 0.0189 | 0.0010 | 0.0017 |
| | | | | 3000 | 0.8 | 0.0152 | 0.0433 | 0.0022 | 0.0039 |
| | | | | 10000 | 0.0 | 0.0010 | 0.0029 | 0.0001 | 0.0003 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0017 | 0.0041 | 0.0004 | 0.0005 |
| | | | | 120 | 4.2 | 0.0017 | 0.0041 | 0.0004 | 0.0005 |
| | | | | 175 | 0.0 | 0.0016 | 0.0043 | 0.0003 | 0.0004 |
| | | | | 175 | 3.1 | 0.0016 | 0.0043 | 0.0003 | 0.0004 |
| | | | | 250 | 0.0 | 0.0019 | 0.0058 | 0.0003 | 0.0005 |
| | | | | 250 | 2.9 | 0.0019 | 0.0058 | 0.0003 | 0.0005 |
| | | | | 500 | 0.0 | 0.0060 | 0.0191 | 0.0010 | 0.0016 |
| | | | | 500 | 5.9 | 0.0060 | 0.0191 | 0.0010 | 0.0016 |
| | | | | 750 | 0.0 | 0.0085 | 0.0267 | 0.0014 | 0.0022 |
| | | | | 750 | 4.6 | 0.0085 | 0.0267 | 0.0014 | 0.0022 |
| | | | | 1000 | 0.0 | 0.0021 | 0.0060 | 0.0003 | 0.0005 |
| | | | | 1000 | 0.7 | 0.0021 | 0.0060 | 0.0003 | 0.0005 |
| | | | | 1500 | 0.0 | 0.0066 | 0.0190 | 0.0009 | 0.0017 |
| | | | | 1500 | 1.5 | 0.0066 | 0.0190 | 0.0009 | 0.0017 |
| | | | | 2000 | 0.0 | 0.0046 | 0.0130 | 0.0006 | 0.0011 |
| | | | | 2000 | 0.9 | 0.0046 | 0.0130 | 0.0006 | 0.0011 |
| | | | | 3000 | 0.0 | 0.0104 | 0.0298 | 0.0015 | 0.0026 |
| | | | | 3000 | 1.3 | 0.0104 | 0.0298 | 0.0015 | 0.0026 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 15.1 | 0.0002 | 0.0002 | 0.0000 | 0.0001 |
| | | | | 120 | 98.1 | 0.0023 | 0.0058 | 0.0004 | 0.0007 |
| | | | | 175 | 61.2 | 0.0022 | 0.0061 | 0.0003 | 0.0005 |
| | | | | 250 | 59.0 | 0.0027 | 0.0086 | 0.0004 | 0.0007 |
| | | | | 500 | 146.1 | 0.0101 | 0.0327 | 0.0015 | 0.0025 |
| | | | | 750 | 19.4 | 0.0022 | 0.0071 | 0.0003 | 0.0006 |
| | | | | 1000 | 32.8 | 0.0066 | 0.0196 | 0.0009 | 0.0016 |
| | | | | 1500 | 32.8 | 0.0092 | 0.0273 | 0.0013 | 0.0022 |
| | | | | 2000 | 14.3 | 0.0056 | 0.0166 | 0.0008 | 0.0014 |
| | | | | 3000 | 23.1 | 0.0128 | 0.0379 | 0.0018 | 0.0031 |
| | | | | 10000 | 0.8 | 0.0009 | 0.0025 | 0.0001 | 0.0002 |
| | | | Backup Pumps | 50 | 9.9 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 120 | 63.8 | 0.0015 | 0.0038 | 0.0003 | 0.0004 |
| | | | | 175 | 39.8 | 0.0014 | 0.0039 | 0.0002 | 0.0003 |
| | | | | 250 | 38.4 | 0.0017 | 0.0053 | 0.0002 | 0.0004 |
| | | | | 500 | 95.1 | 0.0067 | 0.0218 | 0.0010 | 0.0017 |
| | | | | 750 | 12.6 | 0.0014 | 0.0046 | 0.0002 | 0.0004 |
| | | | | 1000 | 21.3 | 0.0043 | 0.0128 | 0.0006 | 0.0010 |
| | | | | 1500 | 21.4 | 0.0060 | 0.0178 | 0.0009 | 0.0015 |
| | | | | 2000 | 9.3 | 0.0036 | 0.0108 | 0.0005 | 0.0009 |
| | | | | 3000 | 15.0 | 0.0083 | 0.0247 | 0.0012 | 0.0020 |
| | | | | 10000 | 0.5 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | Contra Costa | Prime Generators | 50 | 0.5 | 0.0003 | 0.0003 | 0.0000 | 0.0001 |
| | | | | 120 | 3.4 | 0.0029 | 0.0073 | 0.0007 | 0.0010 |
| | | | | 175 | 2.1 | 0.0027 | 0.0074 | 0.0005 | 0.0007 |
| | | | | 250 | 2.1 | 0.0034 | 0.0103 | 0.0006 | 0.0009 |
| | | | | 500 | 5.1 | 0.0119 | 0.0374 | 0.0020 | 0.0031 |
| | | | | 750 | 0.7 | 0.0026 | 0.0082 | 0.0004 | 0.0007 |
| | | | | 1000 | 1.1 | 0.0080 | 0.0228 | 0.0011 | 0.0020 |
| | | | | 1500 | 1.1 | 0.0112 | 0.0318 | 0.0016 | 0.0029 |
| | | | | 2000 | 0.5 | 0.0068 | 0.0193 | 0.0010 | 0.0017 |
| | | | | 3000 | 0.8 | 0.0155 | 0.0441 | 0.0022 | 0.0040 |
| | | | | 10000 | 0.0 | 0.0010 | 0.0029 | 0.0001 | 0.0003 |
| | | | Prime Pumps | 50 | 0.3 | 0.0002 | 0.0002 | 0.0000 | 0.0001 |
| | | | | 120 | 2.2 | 0.0019 | 0.0047 | 0.0005 | 0.0006 |
| | | | | 175 | 1.4 | 0.0017 | 0.0047 | 0.0003 | 0.0005 |
| | | | | 250 | 1.3 | 0.0021 | 0.0064 | 0.0004 | 0.0006 |
| | | | | 500 | 3.3 | 0.0079 | 0.0250 | 0.0014 | 0.0021 |
| | | | | 750 | 0.4 | 0.0017 | 0.0053 | 0.0003 | 0.0005 |
| | | | | 1000 | 0.7 | 0.0052 | 0.0148 | 0.0007 | 0.0013 |
| | | | | 1500 | 0.7 | 0.0073 | 0.0207 | 0.0010 | 0.0019 |
| | | | | 2000 | 0.3 | 0.0044 | 0.0125 | 0.0006 | 0.0011 |
| | | | | 3000 | 0.5 | 0.0101 | 0.0287 | 0.0014 | 0.0026 |
| | | | | 10000 | 0.0 | 0.0007 | 0.0019 | 0.0001 | 0.0002 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0011 | 0.0027 | 0.0003 | 0.0004 |
| | | | | 120 | 2.8 | 0.0011 | 0.0027 | 0.0003 | 0.0004 |
| | | | | 175 | 0.0 | 0.0010 | 0.0028 | 0.0002 | [illegible] |
| | | | | 175 | 2.0 | 0.0010 | 0.0028 | 0.0002 | [illegible] |
| | | | | 250 | 0.0 | 0.0013 | 0.0039 | 0.0002 | [illegible] |
| | | | | 250 | 1.9 | 0.0013 | 0.0039 | 0.0002 | 0.0003 |
| | | | | 500 | 0.0 | 0.0040 | 0.0127 | 0.0007 | 0.0010 |
| | | | | 500 | 3.9 | 0.0040 | 0.0127 | 0.0007 | 0.0010 |
| | | | | 750 | 0.0 | 0.0056 | 0.0177 | 0.0009 | 0.0015 |
| | | | | 750 | 3.1 | 0.0056 | 0.0177 | 0.0009 | 0.0015 |
| | | | | 1000 | 0.0 | 0.0014 | 0.0040 | 0.0002 | 0.0003 |
| | | | | 1000 | 0.4 | 0.0014 | 0.0040 | 0.0002 | 0.0003 |
| | | | | 1500 | 0.0 | 0.0044 | 0.0126 | 0.0006 | 0.0011 |
| | | | | 1500 | 1.0 | 0.0044 | 0.0126 | 0.0006 | 0.0011 |
| | | | | 2000 | 0.0 | 0.0030 | 0.0086 | 0.0004 | 0.0008 |
| | | | | 2000 | 0.6 | 0.0030 | 0.0086 | 0.0004 | 0.0008 |
| | | | | 3000 | 0.0 | 0.0069 | 0.0197 | 0.0010 | 0.0017 |
| | | | | 3000 | 0.9 | 0.0069 | 0.0197 | 0.0010 | 0.0017 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 10.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 120 | 65.0 | 0.0015 | 0.0039 | 0.0003 | 0.0004 |
| | | | | 175 | 40.5 | 0.0014 | 0.0040 | 0.0002 | 0.0004 |
| | | | | 250 | 39.1 | 0.0018 | 0.0057 | 0.0003 | 0.0005 |
| | | | | 500 | 96.8 | 0.0067 | 0.0217 | 0.0010 | 0.0017 |
| | | | | 750 | 12.9 | 0.0015 | 0.0047 | 0.0002 | 0.0004 |
| | | | | 1000 | 21.7 | 0.0044 | 0.0130 | 0.0006 | 0.0011 |
| | | | | 1500 | 21.7 | 0.0061 | 0.0181 | 0.0009 | 0.0015 |
| | | | | 2000 | 9.4 | 0.0037 | 0.0110 | 0.0005 | 0.0009 |
| | | | | 3000 | 15.3 | 0.0085 | 0.0251 | 0.0012 | 0.0021 |
| | | | | 10000 | 0.5 | 0.0006 | 0.0017 | 0.0001 | 0.0001 |
| | | | Backup Pumps | 50 | 6.5 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 42.3 | 0.0010 | 0.0025 | 0.0002 | 0.0003 |
| | | | | 175 | 26.4 | 0.0009 | 0.0026 | 0.0001 | [illegible] |
| | | | | 250 | 25.4 | 0.0011 | 0.0035 | 0.0002 | [illegible] |
| | | | | 500 | 63.0 | 0.0045 | 0.0145 | 0.0006 | 0.0011 |
| | | | | 750 | 8.4 | 0.0010 | 0.0031 | 0.0001 | 0.0002 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 1000 | 14.1 | 0.0028 | 0.0085 | 0.0004 | 0.0007 |
| | | | | 1500 | 14.1 | 0.0040 | 0.0118 | 0.0006 | 0.0010 |
| | | | | 2000 | 6.1 | 0.0024 | 0.0071 | 0.0003 | 0.0006 |
| | | | | 3000 | 9.9 | 0.0055 | 0.0164 | 0.0008 | 0.0013 |
| | | | | 10000 | 0.3 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | Marin | Prime Generators | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.9 | 0.0007 | 0.0018 | 0.0002 | 0.0002 |
| | | | | 175 | 0.5 | 0.0007 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 250 | 0.5 | 0.0008 | 0.0026 | 0.0002 | 0.0002 |
| | | | | 500 | 1.3 | 0.0030 | 0.0094 | 0.0005 | 0.0008 |
| | | | | 750 | 0.2 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.3 | 0.0020 | 0.0058 | 0.0003 | 0.0005 |
| | | | | 1500 | 0.3 | 0.0028 | 0.0080 | 0.0004 | 0.0007 |
| | | | | 2000 | 0.1 | 0.0017 | 0.0049 | 0.0002 | 0.0004 |
| | | | | 3000 | 0.2 | 0.0039 | 0.0111 | 0.0006 | 0.0010 |
| | | | | 10000 | 0.0 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |
| | | | Prime Pumps | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.6 | 0.0005 | 0.0012 | 0.0001 | 0.0002 |
| | | | | 175 | 0.4 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 250 | 0.3 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 500 | 0.8 | 0.0020 | 0.0063 | 0.0003 | 0.0005 |
| | | | | 750 | 0.1 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.2 | 0.0013 | 0.0037 | 0.0002 | 0.0003 |
| | | | | 1500 | 0.2 | 0.0018 | 0.0052 | 0.0003 | 0.0005 |
| | | | | 2000 | 0.1 | 0.0011 | 0.0032 | 0.0002 | 0.0003 |
| | | | | 3000 | 0.1 | 0.0025 | 0.0072 | 0.0004 | 0.0007 |
| | | | | 10000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0003 | 0.0007 | 0.0001 | 0.0001 |
| | | | | 120 | 0.7 | 0.0003 | 0.0007 | 0.0001 | 0.0001 |
| | | | | 175 | 0.0 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 175 | 0.5 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 250 | 0.0 | 0.0003 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 250 | 0.5 | 0.0003 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 500 | 0.0 | 0.0010 | 0.0032 | 0.0002 | 0.0003 |
| | | | | 500 | 1.0 | 0.0010 | 0.0032 | 0.0002 | 0.0003 |
| | | | | 750 | 0.0 | 0.0014 | 0.0045 | 0.0002 | 0.0004 |
| | | | | 750 | 0.8 | 0.0014 | 0.0045 | 0.0002 | 0.0004 |
| | | | | 1000 | 0.0 | 0.0004 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0004 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0011 | 0.0032 | 0.0002 | 0.0003 |
| | | | | 1500 | 0.3 | 0.0011 | 0.0032 | 0.0002 | 0.0003 |
| | | | | 2000 | 0.0 | 0.0008 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.1 | 0.0008 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.0 | 0.0017 | 0.0050 | 0.0002 | 0.0004 |
| | | | | 3000 | 0.2 | 0.0017 | 0.0050 | 0.0002 | 0.0004 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 2.5 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 16.4 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 175 | 10.2 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 250 | 9.9 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 500 | 24.4 | 0.0017 | 0.0055 | 0.0002 | 0.0004 |
| | | | | 750 | 3.2 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 1000 | 5.5 | 0.0011 | 0.0033 | 0.0002 | 0.0003 |
| | | | | 1500 | 5.5 | 0.0015 | 0.0046 | 0.0002 | 0.0004 |
| | | | | 2000 | 2.4 | 0.0009 | 0.0028 | 0.0001 | 0.0002 |
| | | | | 3000 | 3.9 | 0.0021 | 0.0063 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 1.6 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| | | | | | | Emissions (tons/day | | | |
|---|---|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
| | | | | 120 | 10.7 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 175 | 6.7 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 250 | 6.4 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 500 | 15.9 | 0.0011 | 0.0036 | 0.0002 | 0.0003 |
| | | | | 750 | 2.1 | 0.0002 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 1000 | 3.6 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 1500 | 3.6 | 0.0010 | 0.0030 | 0.0001 | 0.0002 |
| | | | | 2000 | 1.6 | 0.0006 | 0.0018 | 0.0001 | 0.0001 |
| | | | | 3000 | 2.5 | 0.0014 | 0.0041 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | Napa | Prime Generators | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.4 | 0.0004 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 175 | 0.3 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 250 | 0.3 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 500 | 0.7 | 0.0016 | 0.0049 | 0.0003 | 0.0004 |
| | | | | 750 | 0.1 | 0.0003 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0010 | 0.0030 | 0.0001 | 0.0003 |
| | | | | 1500 | 0.1 | 0.0015 | 0.0041 | 0.0002 | 0.0004 |
| | | | | 2000 | 0.1 | 0.0009 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0020 | 0.0058 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.3 | 0.0002 | 0.0006 | 0.0001 | 0.0001 |
| | | | | 175 | 0.2 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 250 | 0.2 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 500 | 0.4 | 0.0010 | 0.0033 | 0.0002 | 0.0003 |
| | | | | 750 | 0.1 | 0.0002 | 0.0007 | 0.0000 | [illegible] |
| | | | | 1000 | 0.1 | 0.0007 | 0.0019 | 0.0001 | [illegible] |
| | | | | 1500 | 0.1 | 0.0010 | 0.0027 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.1 | 0.0013 | 0.0037 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 120 | 0.4 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 175 | 0.3 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 250 | 0.2 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0005 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 500 | 0.5 | 0.0005 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0007 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 750 | 0.4 | 0.0007 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 1500 | 0.1 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.1 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0009 | 0.0026 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0009 | 0.0026 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 1.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 8.5 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 175 | 5.3 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 250 | 5.1 | 0.0002 | 0.0007 | 0.0000 | [illegible] |
| | | | | 500 | 12.6 | 0.0009 | 0.0028 | 0.0001 | [illegible] |
| | | | | 750 | 1.7 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 1000 | 2.8 | 0.0006 | 0.0017 | 0.0001 | 0.0001 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 1500 | 2.8 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 2000 | 1.2 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 3000 | 2.0 | 0.0011 | 0.0033 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.9 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 5.5 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 3.4 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 3.3 | 0.0001 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 500 | 8.2 | 0.0006 | 0.0019 | 0.0001 | 0.0001 |
| | | | | 750 | 1.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.8 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1500 | 1.8 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.8 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 3000 | 1.3 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | San Francisco | Prime Generators | 50 | 0.4 | 0.0003 | 0.0002 | 0.0000 | 0.0001 |
| | | | | 120 | 2.7 | 0.0023 | 0.0058 | 0.0006 | 0.0008 |
| | | | | 175 | 1.7 | 0.0022 | 0.0059 | 0.0004 | 0.0006 |
| | | | | 250 | 1.6 | 0.0027 | 0.0082 | 0.0005 | 0.0007 |
| | | | | 500 | 4.1 | 0.0095 | 0.0300 | 0.0016 | 0.0025 |
| | | | | 750 | 0.5 | 0.0021 | 0.0065 | 0.0004 | 0.0006 |
| | | | | 1000 | 0.9 | 0.0064 | 0.0182 | 0.0009 | 0.0016 |
| | | | | 1500 | 0.9 | 0.0089 | 0.0254 | 0.0013 | 0.0023 |
| | | | | 2000 | 0.4 | 0.0054 | 0.0154 | 0.0008 | 0.0014 |
| | | | | 3000 | 0.6 | 0.0124 | 0.0353 | 0.0018 | 0.0032 |
| | | | | 10000 | 0.0 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | Prime Pumps | 50 | 0.3 | 0.0002 | 0.0002 | 0.0000 | 0.0001 |
| | | | | 120 | 1.8 | 0.0015 | 0.0038 | 0.0004 | 0.0005 |
| | | | | 175 | 1.1 | 0.0014 | 0.0038 | 0.0002 | 0.0004 |
| | | | | 250 | 1.1 | 0.0017 | 0.0051 | 0.0003 | 0.0005 |
| | | | | 500 | 2.7 | 0.0063 | 0.0200 | 0.0011 | 0.0017 |
| | | | | 750 | 0.4 | 0.0014 | 0.0043 | 0.0002 | 0.0004 |
| | | | | 1000 | 0.6 | 0.0042 | 0.0119 | 0.0006 | 0.0011 |
| | | | | 1500 | 0.6 | 0.0058 | 0.0165 | 0.0008 | 0.0015 |
| | | | | 2000 | 0.3 | 0.0035 | 0.0100 | 0.0005 | 0.0009 |
| | | | | 3000 | 0.4 | 0.0081 | 0.0230 | 0.0012 | 0.0021 |
| | | | | 10000 | 0.0 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0009 | 0.0022 | 0.0002 | 0.0003 |
| | | | | 120 | 2.2 | 0.0009 | 0.0022 | 0.0002 | 0.0003 |
| | | | | 175 | 0.0 | 0.0008 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 175 | 1.6 | 0.0008 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 250 | 0.0 | 0.0010 | 0.0031 | 0.0002 | 0.0003 |
| | | | | 250 | 1.5 | 0.0010 | 0.0031 | 0.0002 | 0.0003 |
| | | | | 500 | 0.0 | 0.0032 | 0.0101 | 0.0005 | 0.0008 |
| | | | | 500 | 3.1 | 0.0032 | 0.0101 | 0.0005 | 0.0008 |
| | | | | 750 | 0.0 | 0.0045 | 0.0142 | 0.0007 | 0.0012 |
| | | | | 750 | 2.4 | 0.0045 | 0.0142 | 0.0007 | 0.0012 |
| | | | | 1000 | 0.0 | 0.0011 | 0.0032 | 0.0002 | 0.0003 |
| | | | | 1000 | 0.3 | 0.0011 | 0.0032 | 0.0002 | 0.0003 |
| | | | | 1500 | 0.0 | 0.0035 | 0.0100 | 0.0005 | 0.0009 |
| | | | | 1500 | 0.8 | 0.0035 | 0.0100 | 0.0005 | 0.0009 |
| | | | | 2000 | 0.0 | 0.0024 | 0.0069 | 0.0003 | 0.0006 |
| | | | | 2000 | 0.5 | 0.0024 | 0.0069 | 0.0003 | 0.0006 |
| | | | | 3000 | 0.0 | 0.0055 | 0.0158 | 0.0008 | 0.0014 |
| | | | | 3000 | 0.7 | 0.0055 | 0.0158 | 0.0008 | 0.0014 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 8.0 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 52.0 | 0.0012 | 0.0031 | 0.0002 | 0.0004 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

| Revised September 10, 2003, 2003 | | | | | | Emissions (tons/day, | | | |
|---|---|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
| | | | | 175 | 32.4 | 0.0011 | 0.0032 | 0.0002 | 0.0003 |
| | | | | 250 | 31.3 | 0.0015 | 0.0046 | 0.0002 | 0.0004 |
| | | | | 500 | 77.4 | 0.0054 | 0.0174 | 0.0008 | 0.0013 |
| | | | | 750 | 10.3 | 0.0012 | 0.0038 | 0.0002 | 0.0003 |
| | | | | 1000 | 17.4 | 0.0035 | 0.0104 | 0.0005 | 0.0008 |
| | | | | 1500 | 17.4 | 0.0049 | 0.0145 | 0.0007 | 0.0012 |
| | | | | 2000 | 7.6 | 0.0030 | 0.0088 | 0.0004 | 0.0007 |
| | | | | 3000 | 12.2 | 0.0068 | 0.0201 | 0.0010 | 0.0016 |
| | | | | 10000 | 0.4 | 0.0005 | 0.0013 | 0.0001 | 0.0001 |
| | | | Backup Pumps | 50 | 5.2 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 33.8 | 0.0008 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 175 | 21.1 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 250 | 20.3 | 0.0009 | 0.0028 | 0.0001 | 0.0002 |
| | | | | 500 | 50.4 | 0.0036 | 0.0116 | 0.0005 | 0.0009 |
| | | | | 750 | 6.7 | 0.0008 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 1000 | 11.3 | 0.0023 | 0.0068 | 0.0003 | 0.0006 |
| | | | | 1500 | 11.3 | 0.0032 | 0.0094 | 0.0005 | 0.0008 |
| | | | | 2000 | 4.9 | 0.0019 | 0.0057 | 0.0003 | 0.0005 |
| | | | | 3000 | 8.0 | 0.0044 | 0.0131 | 0.0006 | 0.0011 |
| | | | | 10000 | 0.3 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | San Mateo | Prime Generators | 50 | 0.4 | 0.0002 | 0.0002 | 0.0000 | 0.0001 |
| | | | | 120 | 2.5 | 0.0021 | 0.0053 | 0.0005 | 0.0007 |
| | | | | 175 | 1.5 | 0.0020 | 0.0053 | 0.0004 | 0.0005 |
| | | | | 250 | 1.5 | 0.0024 | 0.0074 | 0.0004 | 0.0007 |
| | | | | 500 | 3.7 | 0.0086 | 0.0271 | 0.0015 | 0.0023 |
| | | | | 750 | 0.5 | 0.0019 | 0.0059 | 0.0003 | 0.00[illegible] |
| | | | | 1000 | 0.8 | 0.0058 | 0.0165 | 0.0008 | 0.0[illegible] |
| | | | | 1500 | 0.8 | 0.0081 | 0.0230 | 0.0012 | 0.002[illegible] |
| | | | | 2000 | 0.4 | 0.0049 | 0.0139 | 0.0007 | 0.0012 |
| | | | | 3000 | 0.6 | 0.0112 | 0.0319 | 0.0016 | 0.0029 |
| | | | | 10000 | 0.0 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | Prime Pumps | 50 | 0.2 | 0.0002 | 0.0001 | 0.0000 | 0.0001 |
| | | | | 120 | 1.6 | 0.0014 | 0.0034 | 0.0003 | 0.0005 |
| | | | | 175 | 1.0 | 0.0013 | 0.0034 | 0.0002 | 0.0003 |
| | | | | 250 | 1.0 | 0.0015 | 0.0046 | 0.0003 | 0.0004 |
| | | | | 500 | 2.4 | 0.0057 | 0.0181 | 0.0010 | 0.0015 |
| | | | | 750 | 0.3 | 0.0012 | 0.0039 | 0.0002 | 0.0003 |
| | | | | 1000 | 0.5 | 0.0038 | 0.0107 | 0.0005 | 0.0010 |
| | | | | 1500 | 0.5 | 0.0053 | 0.0150 | 0.0008 | 0.0013 |
| | | | | 2000 | 0.2 | 0.0032 | 0.0091 | 0.0005 | 0.0008 |
| | | | | 3000 | 0.4 | 0.0073 | 0.0208 | 0.0010 | 0.0019 |
| | | | | 10000 | 0.0 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0008 | 0.0020 | 0.0002 | 0.0003 |
| | | | | 120 | 2.0 | 0.0008 | 0.0020 | 0.0002 | 0.0003 |
| | | | | 175 | 0.0 | 0.0008 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 175 | 1.5 | 0.0008 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 250 | 0.0 | 0.0009 | 0.0028 | 0.0002 | 0.0002 |
| | | | | 250 | 1.4 | 0.0009 | 0.0028 | 0.0002 | 0.0002 |
| | | | | 500 | 0.0 | 0.0029 | 0.0092 | 0.0005 | 0.0007 |
| | | | | 500 | 2.8 | 0.0029 | 0.0092 | 0.0005 | 0.0007 |
| | | | | 750 | 0.0 | 0.0040 | 0.0128 | 0.0007 | 0.0011 |
| | | | | 750 | 2.2 | 0.0040 | 0.0128 | 0.0007 | 0.0011 |
| | | | | 1000 | 0.0 | 0.0010 | 0.0029 | 0.0001 | 0.0003 |
| | | | | 1000 | 0.3 | 0.0010 | 0.0029 | 0.0001 | 0.0003 |
| | | | | 1500 | 0.0 | 0.0032 | 0.0091 | 0.0004 | 0.0008 |
| | | | | 1500 | 0.7 | 0.0032 | 0.0091 | 0.0004 | 0.0[illegible] |
| | | | | 2000 | 0.0 | 0.0022 | 0.0062 | 0.0003 | 0.00[illegible] |
| | | | | 2000 | 0.4 | 0.0022 | 0.0062 | 0.0003 | 0.0005 |
| | | | | 3000 | 0.0 | 0.0050 | 0.0143 | 0.0007 | 0.0013 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 3000 | 0.6 | 0.0050 | 0.0143 | 0.0007 | 0.0013 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 7.3 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 47.0 | 0.0011 | 0.0028 | 0.0002 | 0.0003 |
| | | | | 175 | 29.3 | 0.0010 | 0.0029 | 0.0001 | 0.0003 |
| | | | | 250 | 28.3 | 0.0013 | 0.0041 | 0.0002 | 0.0003 |
| | | | | 500 | 70.0 | 0.0048 | 0.0157 | 0.0007 | 0.0012 |
| | | | | 750 | 9.3 | 0.0011 | 0.0034 | 0.0002 | 0.0003 |
| | | | | 1000 | 15.7 | 0.0032 | 0.0094 | 0.0004 | 0.0008 |
| | | | | 1500 | 15.7 | 0.0044 | 0.0131 | 0.0006 | 0.0011 |
| | | | | 2000 | 6.8 | 0.0027 | 0.0079 | 0.0004 | 0.0006 |
| | | | | 3000 | 11.1 | 0.0061 | 0.0182 | 0.0009 | 0.0015 |
| | | | | 10000 | 0.4 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | Backup Pumps | 50 | 4.7 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 30.6 | 0.0007 | 0.0018 | 0.0001 | 0.0002 |
| | | | | 175 | 19.1 | 0.0007 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 250 | 18.4 | 0.0008 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 500 | 45.5 | 0.0032 | 0.0105 | 0.0005 | 0.0008 |
| | | | | 750 | 6.1 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 1000 | 10.2 | 0.0021 | 0.0061 | 0.0003 | 0.0005 |
| | | | | 1500 | 10.2 | 0.0029 | 0.0085 | 0.0004 | 0.0007 |
| | | | | 2000 | 4.4 | 0.0017 | 0.0052 | 0.0002 | 0.0004 |
| | | | | 3000 | 7.2 | 0.0040 | 0.0118 | 0.0006 | 0.0010 |
| | | | | 10000 | 0.2 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | Santa Clara | Prime Generators | 50 | 0.9 | 0.0006 | 0.0005 | 0.0001 | 0.0002 |
| | | | | 120 | 6.0 | 0.0051 | 0.0127 | 0.0013 | 0.0017 |
| | | | | 175 | 3.7 | 0.0047 | 0.0128 | 0.0008 | 0.0013 |
| | | | | 250 | 3.6 | 0.0059 | 0.0179 | 0.0011 | 0.0016 |
| | | | | 500 | 8.9 | 0.0207 | 0.0652 | 0.0035 | 0.0055 |
| | | | | 750 | 1.2 | 0.0045 | 0.0142 | 0.0008 | 0.0012 |
| | | | | 1000 | 2.0 | 0.0140 | 0.0397 | 0.0020 | 0.0036 |
| | | | | 1500 | 2.0 | 0.0195 | 0.0553 | 0.0028 | 0.0050 |
| | | | | 2000 | 0.9 | 0.0118 | 0.0335 | 0.0017 | 0.0030 |
| | | | | 3000 | 1.4 | 0.0270 | 0.0768 | 0.0039 | 0.0069 |
| | | | | 10000 | 0.0 | 0.0018 | 0.0051 | 0.0003 | 0.0005 |
| | | | Prime Pumps | 50 | 0.6 | 0.0004 | 0.0004 | 0.0001 | 0.0002 |
| | | | | 120 | 3.9 | 0.0033 | 0.0082 | 0.0008 | 0.0011 |
| | | | | 175 | 2.4 | 0.0030 | 0.0082 | 0.0005 | 0.0008 |
| | | | | 250 | 2.3 | 0.0036 | 0.0111 | 0.0007 | 0.0010 |
| | | | | 500 | 5.8 | 0.0138 | 0.0435 | 0.0024 | 0.0036 |
| | | | | 750 | 0.8 | 0.0030 | 0.0093 | 0.0005 | 0.0008 |
| | | | | 1000 | 1.3 | 0.0091 | 0.0258 | 0.0013 | 0.0023 |
| | | | | 1500 | 1.3 | 0.0127 | 0.0360 | 0.0018 | 0.0032 |
| | | | | 2000 | 0.6 | 0.0077 | 0.0218 | 0.0011 | 0.0020 |
| | | | | 3000 | 0.9 | 0.0176 | 0.0500 | 0.0025 | 0.0045 |
| | | | | 10000 | 0.0 | 0.0012 | 0.0033 | 0.0002 | 0.0003 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0019 | 0.0048 | 0.0005 | 0.0006 |
| | | | | 120 | 4.8 | 0.0019 | 0.0048 | 0.0005 | 0.0006 |
| | | | | 175 | 0.0 | 0.0018 | 0.0049 | 0.0003 | 0.0005 |
| | | | | 175 | 3.6 | 0.0018 | 0.0049 | 0.0003 | 0.0005 |
| | | | | 250 | 0.0 | 0.0022 | 0.0067 | 0.0004 | 0.0006 |
| | | | | 250 | 3.3 | 0.0022 | 0.0067 | 0.0004 | 0.0006 |
| | | | | 500 | 0.0 | 0.0070 | 0.0221 | 0.0011 | 0.0018 |
| | | | | 500 | 6.9 | 0.0070 | 0.0221 | 0.0011 | 0.0018 |
| | | | | 750 | 0.0 | 0.0097 | 0.0308 | 0.0016 | 0.0025 |
| | | | | 750 | 5.3 | 0.0097 | 0.0308 | 0.0016 | 0.0025 |
| | | | | 1000 | 0.0 | 0.0024 | 0.0069 | 0.0003 | 0.0006 |
| | | | | 1000 | 0.8 | 0.0024 | 0.0069 | 0.0003 | 0.0006 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 1500 | 0.0 | 0.0077 | 0.0219 | 0.0011 | 0.0019 |
| | | | | 1500 | 1.8 | 0.0077 | 0.0219 | 0.0011 | 0.0019 |
| | | | | 2000 | 0.0 | 0.0053 | 0.0150 | 0.0007 | 0.0013 |
| | | | | 2000 | 1.0 | 0.0053 | 0.0150 | 0.0007 | 0.0013 |
| | | | | 3000 | 0.0 | 0.0120 | 0.0344 | 0.0017 | 0.0030 |
| | | | | 3000 | 1.5 | 0.0120 | 0.0344 | 0.0017 | 0.0030 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 17.5 | 0.0002 | 0.0003 | 0.0000 | 0.0001 |
| | | | | 120 | 113.1 | 0.0026 | 0.0067 | 0.0005 | 0.0008 |
| | | | | 175 | 70.6 | 0.0025 | 0.0070 | 0.0004 | 0.0006 |
| | | | | 250 | 68.0 | 0.0032 | 0.0099 | 0.0005 | 0.0008 |
| | | | | 500 | 168.5 | 0.0116 | 0.0378 | 0.0017 | 0.0029 |
| | | | | 750 | 22.4 | 0.0025 | 0.0082 | 0.0004 | 0.0006 |
| | | | | 1000 | 37.8 | 0.0076 | 0.0226 | 0.0011 | 0.0018 |
| | | | | 1500 | 37.9 | 0.0106 | 0.0315 | 0.0015 | 0.0026 |
| | | | | 2000 | 16.4 | 0.0064 | 0.0191 | 0.0009 | 0.0016 |
| | | | | 3000 | 26.6 | 0.0147 | 0.0438 | 0.0021 | 0.0036 |
| | | | | 10000 | 0.9 | 0.0010 | 0.0029 | 0.0001 | 0.0002 |
| | | | Backup Pumps | 50 | 11.4 | 0.0001 | 0.0002 | 0.0000 | 0.0001 |
| | | | | 120 | 73.6 | 0.0017 | 0.0044 | 0.0003 | 0.0005 |
| | | | | 175 | 45.9 | 0.0016 | 0.0045 | 0.0002 | 0.0004 |
| | | | | 250 | 44.3 | 0.0019 | 0.0061 | 0.0003 | 0.0005 |
| | | | | 500 | 109.7 | 0.0078 | 0.0252 | 0.0011 | 0.0019 |
| | | | | 750 | 14.6 | 0.0017 | 0.0054 | 0.0002 | 0.0004 |
| | | | | 1000 | 24.6 | 0.0050 | 0.0147 | 0.0007 | 0.0012 |
| | | | | 1500 | 24.6 | 0.0069 | 0.0205 | 0.0010 | 0.0[illegible] |
| | | | | 2000 | 10.7 | 0.0042 | 0.0124 | 0.0006 | 0.[illegible] |
| | | | | 3000 | 17.3 | 0.0096 | 0.0285 | 0.0014 | 0.0[illegible] |
| | | | | 10000 | 0.6 | 0.0006 | 0.0019 | 0.0001 | 0.0002 |
| | | Solano | Prime Generators | 50 | 0.2 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 1.0 | 0.0008 | 0.0021 | 0.0002 | 0.0003 |
| | | | | 175 | 0.6 | 0.0008 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 250 | 0.6 | 0.0010 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 500 | 1.5 | 0.0034 | 0.0107 | 0.0006 | 0.0009 |
| | | | | 750 | 0.2 | 0.0007 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.3 | 0.0023 | 0.0065 | 0.0003 | 0.0006 |
| | | | | 1500 | 0.3 | 0.0032 | 0.0091 | 0.0005 | 0.0008 |
| | | | | 2000 | 0.1 | 0.0019 | 0.0055 | 0.0003 | 0.0005 |
| | | | | 3000 | 0.2 | 0.0045 | 0.0127 | 0.0006 | 0.0011 |
| | | | | 10000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | Prime Pumps | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.6 | 0.0005 | 0.0014 | 0.0001 | 0.0002 |
| | | | | 175 | 0.4 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 250 | 0.4 | 0.0006 | 0.0018 | 0.0001 | 0.0002 |
| | | | | 500 | 1.0 | 0.0023 | 0.0072 | 0.0004 | 0.0006 |
| | | | | 750 | 0.1 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.2 | 0.0015 | 0.0043 | 0.0002 | 0.0004 |
| | | | | 1500 | 0.2 | 0.0021 | 0.0059 | 0.0003 | 0.0005 |
| | | | | 2000 | 0.1 | 0.0013 | 0.0036 | 0.0002 | 0.0003 |
| | | | | 3000 | 0.2 | 0.0029 | 0.0082 | 0.0004 | 0.0007 |
| | | | | 10000 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0003 | 0.0008 | 0.0001 | 0.0001 |
| | | | | 120 | 0.8 | 0.0003 | 0.0008 | 0.0001 | 0.0001 |
| | | | | 175 | 0.0 | 0.0003 | 0.0008 | 0.0001 | 0.0001 |
| | | | | 175 | 0.6 | 0.0003 | 0.0008 | 0.0001 | 0.[illegible] |
| | | | | 250 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.[illegible] |
| | | | | 250 | 0.5 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 500 | 0.0 | 0.0011 | 0.0036 | 0.0002 | 0.0003 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 500 | 1.1 | 0.0011 | 0.0036 | 0.0002 | 0.0003 |
| | | | | 750 | 0.0 | 0.0016 | 0.0051 | 0.0003 | 0.0004 |
| | | | | 750 | 0.9 | 0.0016 | 0.0051 | 0.0003 | 0.0004 |
| | | | | 1000 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0013 | 0.0036 | 0.0002 | 0.0003 |
| | | | | 1500 | 0.3 | 0.0013 | 0.0036 | 0.0002 | 0.0003 |
| | | | | 2000 | 0.0 | 0.0009 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.2 | 0.0009 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.0 | 0.0020 | 0.0057 | 0.0003 | 0.0005 |
| | | | | 3000 | 0.3 | 0.0020 | 0.0057 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 2.9 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 18.7 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 175 | 11.6 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 250 | 11.2 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 500 | 27.8 | 0.0019 | 0.0062 | 0.0003 | 0.0005 |
| | | | | 750 | 3.7 | 0.0004 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 1000 | 6.2 | 0.0013 | 0.0037 | 0.0002 | 0.0003 |
| | | | | 1500 | 6.2 | 0.0018 | 0.0052 | 0.0002 | 0.0004 |
| | | | | 2000 | 2.7 | 0.0011 | 0.0031 | 0.0002 | 0.0003 |
| | | | | 3000 | 4.4 | 0.0024 | 0.0072 | 0.0003 | 0.0006 |
| | | | | 10000 | 0.2 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 1.9 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 12.1 | 0.0003 | 0.0007 | 0.0001 | 0.0001 |
| | | | | 175 | 7.6 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 250 | 7.3 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 500 | 18.1 | 0.0013 | 0.0042 | 0.0002 | 0.0003 |
| | | | | 750 | 2.4 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 1000 | 4.1 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 1500 | 4.1 | 0.0011 | 0.0034 | 0.0002 | 0.0003 |
| | | | | 2000 | 1.8 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 3000 | 2.9 | 0.0016 | 0.0047 | 0.0002 | 0.0004 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | Sonoma | Prime Generators | 50 | 0.2 | 0.0001 | 0.0001 | 0.0000 | 0.0001 |
| | | | | 120 | 1.4 | 0.0012 | 0.0030 | 0.0003 | 0.0004 |
| | | | | 175 | 0.9 | 0.0011 | 0.0031 | 0.0002 | 0.0003 |
| | | | | 250 | 0.9 | 0.0014 | 0.0043 | 0.0003 | 0.0004 |
| | | | | 500 | 2.1 | 0.0050 | 0.0156 | 0.0008 | 0.0013 |
| | | | | 750 | 0.3 | 0.0011 | 0.0034 | 0.0002 | 0.0003 |
| | | | | 1000 | 0.5 | 0.0033 | 0.0095 | 0.0005 | 0.0009 |
| | | | | 1500 | 0.5 | 0.0047 | 0.0133 | 0.0007 | 0.0012 |
| | | | | 2000 | 0.2 | 0.0028 | 0.0080 | 0.0004 | 0.0007 |
| | | | | 3000 | 0.3 | 0.0065 | 0.0184 | 0.0009 | 0.0017 |
| | | | | 10000 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | Prime Pumps | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.9 | 0.0008 | 0.0020 | 0.0002 | 0.0003 |
| | | | | 175 | 0.6 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 250 | 0.6 | 0.0009 | 0.0027 | 0.0002 | 0.0002 |
| | | | | 500 | 1.4 | 0.0033 | 0.0104 | 0.0006 | 0.0009 |
| | | | | 750 | 0.2 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.3 | 0.0022 | 0.0062 | 0.0003 | 0.0006 |
| | | | | 1500 | 0.3 | 0.0030 | 0.0086 | 0.0004 | 0.0008 |
| | | | | 2000 | 0.1 | 0.0018 | 0.0052 | 0.0003 | 0.0005 |
| | | | | 3000 | 0.2 | 0.0042 | 0.0120 | 0.0006 | 0.0011 |
| | | | | 10000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0005 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 120 | 1.2 | 0.0005 | 0.0011 | 0.0001 | 0.0001 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 175 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 175 | 0.9 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 250 | 0.0 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 250 | 0.8 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 500 | 0.0 | 0.0017 | 0.0053 | 0.0003 | 0.0004 |
| | | | | 500 | 1.6 | 0.0017 | 0.0053 | 0.0003 | 0.0004 |
| | | | | 750 | 0.0 | 0.0023 | 0.0074 | 0.0004 | 0.0006 |
| | | | | 750 | 1.3 | 0.0023 | 0.0074 | 0.0004 | 0.0006 |
| | | | | 1000 | 0.0 | 0.0006 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.2 | 0.0006 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0018 | 0.0052 | 0.0003 | 0.0005 |
| | | | | 1500 | 0.4 | 0.0018 | 0.0052 | 0.0003 | 0.0005 |
| | | | | 2000 | 0.0 | 0.0013 | 0.0036 | 0.0002 | 0.0003 |
| | | | | 2000 | 0.2 | 0.0013 | 0.0036 | 0.0002 | 0.0003 |
| | | | | 3000 | 0.0 | 0.0029 | 0.0082 | 0.0004 | 0.0007 |
| | | | | 3000 | 0.4 | 0.0029 | 0.0082 | 0.0004 | 0.0007 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 4.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 27.1 | 0.0006 | 0.0016 | 0.0001 | 0.0002 |
| | | | | 175 | 16.9 | 0.0006 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 250 | 16.3 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 500 | 40.4 | 0.0028 | 0.0091 | 0.0004 | 0.0007 |
| | | | | 750 | 5.4 | 0.0006 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 1000 | 9.1 | 0.0018 | 0.0054 | 0.0003 | 0.0004 |
| | | | | 1500 | 9.1 | 0.0025 | 0.0076 | 0.0004 | 0.0006 |
| | | | | 2000 | 3.9 | 0.0015 | 0.0046 | 0.0002 | [illegible] |
| | | | | 3000 | 6.4 | 0.0035 | 0.0105 | 0.0005 | [illegible] |
| | | | | 10000 | 0.2 | 0.0002 | 0.0007 | 0.0000 | [illegible] |
| | | | Backup Pumps | 50 | 2.7 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 17.7 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 175 | 11.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 250 | 10.6 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 500 | 26.3 | 0.0019 | 0.0060 | 0.0003 | 0.0005 |
| | | | | 750 | 3.5 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 1000 | 5.9 | 0.0012 | 0.0035 | 0.0002 | 0.0003 |
| | | | | 1500 | 5.9 | 0.0017 | 0.0049 | 0.0002 | 0.0004 |
| | | | | 2000 | 2.6 | 0.0010 | 0.0030 | 0.0001 | 0.0002 |
| | | | | 3000 | 4.2 | 0.0023 | 0.0068 | 0.0003 | 0.0006 |
| | | | | 10000 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| Bay Area AQMD Total | 0 | 0 | 0 | | 4084.0 | 1.5569 | 4.5707 | 0.2385 | 0.4004 |
| Butte County AQMD | Sacramento Valley | Butte | Prime Generators | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.7 | 0.0006 | 0.0015 | 0.0002 | 0.0002 |
| | | | | 175 | 0.5 | 0.0006 | 0.0016 | 0.0001 | 0.0002 |
| | | | | 250 | 0.4 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 500 | 1.1 | 0.0025 | 0.0079 | 0.0004 | 0.0007 |
| | | | | 750 | 0.1 | 0.0006 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.2 | 0.0017 | 0.0048 | 0.0002 | 0.0004 |
| | | | | 1500 | 0.2 | 0.0024 | 0.0067 | 0.0003 | 0.0006 |
| | | | | 2000 | 0.1 | 0.0014 | 0.0041 | 0.0002 | 0.0004 |
| | | | | 3000 | 0.2 | 0.0033 | 0.0093 | 0.0005 | 0.0008 |
| | | | | 10000 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | Prime Pumps | 50 | 0.1 | 0.0001 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.5 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 175 | 0.3 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 250 | 0.3 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 500 | 0.7 | 0.0017 | 0.0053 | 0.0003 | [illegible] |
| | | | | 750 | 0.1 | 0.0004 | 0.0011 | 0.0001 | [illegible] |
| | | | | 1000 | 0.2 | 0.0011 | 0.0031 | 0.0002 | 0.0003 |
| | | | | 1500 | 0.2 | 0.0015 | 0.0044 | 0.0002 | 0.0004 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 2000 | 0.1 | 0.0009 | 0.0027 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0021 | 0.0061 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 2.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 13.7 | 0.0003 | 0.0008 | 0.0001 | 0.0001 |
| | | | | 175 | 8.6 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 250 | 8.3 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 500 | 20.5 | 0.0014 | 0.0046 | 0.0002 | 0.0004 |
| | | | | 750 | 2.7 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 1000 | 4.6 | 0.0009 | 0.0027 | 0.0001 | 0.0002 |
| | | | | 1500 | 4.6 | 0.0013 | 0.0038 | 0.0002 | 0.0003 |
| | | | | 2000 | 2.0 | 0.0008 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 3000 | 3.2 | 0.0018 | 0.0053 | 0.0003 | 0.0004 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 1.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 8.9 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 175 | 5.6 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 250 | 5.4 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 500 | 13.3 | 0.0009 | 0.0031 | 0.0001 | 0.0002 |
| | | | | 750 | 1.8 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 1000 | 3.0 | 0.0006 | 0.0018 | 0.0001 | 0.0001 |
| | | | | 1500 | 3.0 | 0.0008 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 2000 | 1.3 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 3000 | 2.1 | 0.0012 | 0.0035 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| Butte County AQMD Total | 0 | 0 | 0 | | 122.4 | 0.0359 | 0.1051 | 0.0055 | 0.0092 |
| Calaveras County AQMD | Mountain Counties | Calaveras | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 500 | 0.2 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0007 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0003 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| | | | | | | Emissions (tons/day | | | |
|---|---|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 2.8 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 1.7 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 1.7 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 4.1 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 750 | 0.6 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.9 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.9 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.4 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.7 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.8 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 1.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 1.1 | 0.0000 | 0.0002 | 0.0000 | [illegible] |
| | | | | 500 | 2.7 | 0.0002 | 0.0006 | 0.0000 | [illegible] |
| | | | | 750 | 0.4 | 0.0000 | 0.0001 | 0.0000 | [illegible] |
| | | | | 1000 | 0.6 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.6 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.3 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.4 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Calaveras County AQMD Total | 0 | 0 | 0 | | 24.8 | 0.0073 | 0.0213 | 0.0011 | 0.0019 |
| Colusa County APCD | Sacramento Valley | Colusa | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175. | 0.0 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0002 | 0.0006 | 0.0000 | [illegible] |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.3 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.8 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.8 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.9 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 750 | 0.3 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.4 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.4 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.3 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.8 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.5 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.5 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 750 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Colusa County APCD Total | 0 | 0 | 0 | | 11.5 | 0.0034 | 0.0098 | 0.0005 | 0.0009 |
| El Dorado County APCD | Lake Tahoe | El Dorado | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 500 | 0.2 | 0.0004 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day | | | |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 2.4 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 1.5 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 1.4 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 3.5 | 0.0002 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 750 | 0.5 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.8 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.8 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.3 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.6 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.5 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 1.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.9 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 2.3 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 750 | 0.3 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.5 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.5 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.2 | 0.0001 | 0.0003 | 0.0000 | [illegible] |
| | | | | 3000 | 0.4 | 0.0002 | 0.0006 | 0.0000 | [illegible] |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | Mountain Counties | | Prime Generators | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.4 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 175 | 0.3 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 250 | 0.3 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 500 | 0.7 | 0.0016 | 0.0049 | 0.0003 | 0.0004 |
| | | | | 750 | 0.1 | 0.0003 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0010 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 1500 | 0.1 | 0.0015 | 0.0042 | 0.0002 | 0.0004 |
| | | | | 2000 | 0.1 | 0.0009 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0020 | 0.0058 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.3 | 0.0003 | 0.0006 | 0.0001 | 0.0001 |
| | | | | 175 | 0.2 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 250 | 0.2 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 500 | 0.4 | 0.0010 | 0.0033 | 0.0002 | 0.0003 |
| | | | | 750 | 0.1 | 0.0002 | 0.0007 | 0.0000 | [illegible] |
| | | | | 1000 | 0.1 | 0.0007 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 1500 | 0.1 | 0.0010 | 0.0027 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.1 | 0.0013 | 0.0038 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 1.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 8.5 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 175 | 5.3 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 250 | 5.1 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 500 | 12.7 | 0.0009 | 0.0028 | 0.0001 | 0.0002 |
| | | | | 750 | 1.7 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 1000 | 2.8 | 0.0006 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 1500 | 2.8 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 2000 | 1.2 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 3000 | 2.0 | 0.0011 | 0.0033 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.9 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 5.5 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 3.5 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 3.3 | 0.0001 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 500 | 8.2 | 0.0006 | 0.0019 | 0.0001 | 0.0001 |
| | | | | 750 | 1.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.8 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1500 | 1.9 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.8 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 3000 | 1.3 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| El Dorado County APCD Total | 0 | 0 | 0 | | 96.8 | 0.0284 | 0.0831 | 0.0043 | 0.0073 |
| eather River AQMD | Sacramento Valley | Sutter | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.3 | 0.0002 | 0.0006 | 0.0001 | 0.0001 |
| | | | | 175 | 0.2 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 250 | 0.2 | 0.0003 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 500 | 0.4 | 0.0010 | 0.0031 | 0.0002 | 0.0003 |
| | | | | 750 | 0.1 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0007 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 1500 | 0.1 | 0.0009 | 0.0027 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.1 | 0.0013 | 0.0037 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50. | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.2 | 0.0002 | 0.0004 | 0.0000 | 0.0001 |
| | | | | 175 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 500 | 0.3 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 750 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.1 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 1500 | 0.1 | 0.0006 | 0.0017 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | Backup Generators | 50 | 0.8 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 5.4 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 3.4 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 3.3 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 500 | 8.1 | 0.0006 | 0.0018 | 0.0001 | 0.0001 |
| | | | | 750 | 1.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.8 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1500 | 1.8 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.8 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 3000 | 1.3 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.5 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 3.5 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 2.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 2.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 500 | 5.3 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 750 | 0.7 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.2 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 1500 | 1.2 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.5 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.8 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | Yuba | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.2 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 175 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.00 |
| | | | | 250 | 0.1 | 0.0002 | 0.0007 | 0.0000 | 0.0 |
| | | | | 500 | 0.3 | 0.0008 | 0.0024 | 0.0001 | 0.0 |
| | | | | 750 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.1 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 1500 | 0.1 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.1 | 0.0010 | 0.0028 | 0.0001 | 0.0003 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 500 | 0.2 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0005 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0006 | 0.0018 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.6 | 0.0000 | 0.0000 | 0.0000 | 0.0 |
| | | | | 120 | 4.1 | 0.0001 | 0.0002 | 0.0000 | 0.00 |
| | | | | 175 | 2.6 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 250 | 2.5 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 500 | 6.1 | 0.0004 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 750 | 0.8 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.4 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 1500 | 1.4 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.6 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 3000 | 1.0 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 2.7 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 1.7 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 1.6 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 4.0 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 750 | 0.5 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.9 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.9 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.4 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.6 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| Feather River AQMD Total | 0 | 0 | 0 | | 84.9 | 0.0249 | 0.0729 | 0.0038 | 0.0064 |
| Glenn County APCD | Sacramento Valley | Glenn | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0003 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.8 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 1.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 1.1 | 0.0000 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 2.6 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 750 | 0.3 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 1000 | 0.6 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.6 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.3 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.4 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.7 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.7 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.7 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 750 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.4 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.4 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.3 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Glenn County APCD Total | 0 | 0 | 0 | | 15.7 | 0.0046 | 0.0135 | 0.0007 | 0.0012 |
| Great Basin Unified APCD | Great Basin Valleys | Alpine | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 3000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | [illegible] |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | Inyo | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 750 | 0.0 | 0.0000 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0001 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.7 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.7 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.8 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 750 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.4 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.4 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.3 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.8 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 175 | 0.5 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.5 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 750 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | Mono | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0002 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.00[illegible] |
| | | | | 1000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0[illegible] |
| | | | | 1500 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.00[illegible] |
| | | | | 2000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.9 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.5 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.5 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.3 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 750 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.6 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.4 | 0.0000 | 0.0000 | 0.0000 | 0.0[illegible] |
| | | | | 250 | 0.3 | 0.0000 | 0.0000 | 0.0000 | 0.0[illegible] |
| | | | | 500 | 0.9 | 0.0001 | 0.0002 | 0.0000 | 0.000[illegible] |
| | | | | 750 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 1000 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Great Basin Unified APCD Total | 0 | 0 | 0 | | 19.2 | 0.0056 | 0.0165 | 0.0009 | 0.0014 |
| Imperial County APCD | Salton Sea | Imperial | Prime Generators | 50 | 0.1 | 0.0001 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.5 | 0.0005 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 175 | 0.3 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 250 | 0.3 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 500 | 0.8 | 0.0018 | 0.0058 | 0.0003 | 0.0005 |
| | | | | 750 | 0.1 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.2 | 0.0012 | 0.0035 | 0.0002 | 0.0003 |
| | | | | 1500 | 0.2 | 0.0017 | 0.0049 | 0.0002 | 0.0004 |
| | | | | 2000 | 0.1 | 0.0010 | 0.0030 | 0.0001 | 0.0003 |
| | | | | 3000 | 0.1 | 0.0024 | 0.0068 | 0.0003 | 0.0006 |
| | | | | 10000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.3 | 0.0003 | 0.0007 | 0.0001 | 0.0001 |
| | | | | 175 | 0.2 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 250 | 0.2 | 0.0003 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 500 | 0.5 | 0.0012 | 0.0038 | 0.0002 | 0.0003 |
| | | | | 750 | 0.1 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0008 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 1500 | 0.1 | 0.0011 | 0.0032 | 0.0002 | 0.0003 |
| | | | | 2000 | 0.0 | 0.0007 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0016 | 0.0044 | 0.0002 | 0.0004 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 1.5 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 10.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 175 | 6.2 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 250 | 6.0 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 500 | 14.9 | 0.0010 | 0.0033 | 0.0001 | 0.0003 |
| | | | | 750 | 2.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 1000 | 3.3 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 1500 | 3.3 | 0.0009 | 0.0028 | 0.0001 | 0.0002 |
| | | | | 2000 | 1.5 | 0.0006 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 3000 | 2.4 | 0.0013 | 0.0039 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 1.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 6.5 | 0.0002 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 175 | 4.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 250 | 3.9 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 500 | 9.7 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 750 | 1.3 | 0.0001 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1000 | 2.2 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 1500 | 2.2 | 0.0006 | 0.0018 | 0.0001 | 0.0001 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day, | | | |
| | | | | 2000 | 0.9 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 3000 | 1.5 | 0.0008 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| Imperial County APCD Total | 0 | 0 | 0 | | 89.0 | 0.0261 | 0.0765 | 0.0040 | 0.0067 |
| Kern County APCD | Mojave Desert | Kern | Prime Generators | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.4 | 0.0004 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 175 | 0.3 | 0.0003 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 250 | 0.2 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 500 | 0.6 | 0.0014 | 0.0045 | 0.0002 | 0.0004 |
| | | | | 750 | 0.1 | 0.0003 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0010 | 0.0027 | 0.0001 | 0.0002 |
| | | | | 1500 | 0.1 | 0.0013 | 0.0038 | 0.0002 | 0.0003 |
| | | | | 2000 | 0.1 | 0.0008 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0019 | 0.0053 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.3 | 0.0002 | 0.0006 | 0.0001 | 0.0001 |
| | | | | 175 | 0.2 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 250 | 0.2 | 0.0002 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 500 | 0.4 | 0.0009 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 750 | 0.1 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0006 | 0.0018 | 0.0001 | 0.0002 |
| | | | | 1500 | 0.1 | 0.0009 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.1 | 0.0012 | 0.0034 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0[illegible] |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.[illegible] |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0[illegible] |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 1.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 7.8 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 175 | 4.9 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 250 | 4.7 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 500 | 11.6 | 0.0008 | 0.0026 | 0.0001 | 0.0002 |
| | | | | 750 | 1.5 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 1000 | 2.6 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 1500 | 2.6 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 2000 | 1.1 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 3000 | 1.8 | 0.0010 | 0.0030 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.8 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 5.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 3.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 3.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 500 | 7.5 | 0.0005 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 750 | 1.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.7 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 1500 | 1.7 | 0.0005 | 0.0014 | 0.0001 | 0.[illegible] |
| | | | | 2000 | 0.7 | 0.0003 | 0.0009 | 0.0000 | 0.[illegible] |
| | | | | 3000 | 1.2 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| Kern County APCD Total | 0 | 0 | 0 | | 69.3 | 0.0203 | 0.0595 | 0.0031 | 0.0052 |
| Lake County AQMD | Lake County | Lake | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.2 | 0.0002 | 0.0004 | 0.0000 | 0.0001 |
| | | | | 175 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 500 | 0.3 | 0.0007 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 750 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.1 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 1500 | 0.1 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0010 | 0.0027 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 500 | 0.2 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0005 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0006 | 0.0018 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.6 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 4.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 2.5 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 2.4 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 500 | 6.0 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 750 | 0.8 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.3 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 1500 | 1.3 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.6 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.9 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 2.6 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 1.6 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 1.6 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 3.9 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 750 | 0.5 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.9 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.9 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.4 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.6 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| Lake County AQMD Total | 0 | 0 | 0 | | 35.8 | 0.0105 | 0.0308 | 0.0016 | 0.0027 |
| Lassen County APCD | Northeast Plateau | Lassen | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

| Revised September 10, 2003, 2003 | | | | | | Emissions (tons/day, | | | |
|---|---|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
| | | | | 120 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 500 | 0.2 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0002 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.00 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 2.2 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 1.4 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 1.4 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 3.3 | 0.0002 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 750 | 0.4 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.8 | 0.0002 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.8 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.3 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.5 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.5 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.9 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.9 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 2.2 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 750 | 0.3 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.5 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.5 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.3 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Lassen County APCD Total | 0 | 0 | 0 | | 20.0 | 0.0059 | 0.0172 | 0.0009 | 0.0015 |
| Mariposa County APCD | Mountain Counties | Mariposa | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.00 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 500 | 0.1 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.7 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.7 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.7 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 750 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.4 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.4 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.3 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.7 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.5 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.4 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 750 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.2 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Mariposa County APCD Total | 0 | 0 | 0 | | 10.2 | 0.0030 | 0.0088 | 0.0005 | 0.0008 |
| Mendocino County AQMD | North Coast | Mendocino | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.3 | 0.0003 | 0.0006 | 0.0001 | 0.0001 |
| | | | | 175 | 0.2 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 250 | 0.2 | 0.0003 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 500 | 0.5 | 0.0011 | 0.0033 | 0.0002 | 0.0003 |
| | | | | 750 | 0.1 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day, CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 1000 | 0.1 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 1500 | 0.1 | 0.0010 | 0.0028 | 0.0001 | 0.0003 |
| | | | | 2000 | 0.0 | 0.0006 | 0.0017 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0014 | 0.0039 | 0.0002 | 0.0004 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.2 | 0.0002 | 0.0004 | 0.0000 | 0.0001 |
| | | | | 175 | 0.1 | 0.0002 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 500 | 0.3 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 750 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.1 | 0.0005 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 1500 | 0.1 | 0.0006 | 0.0018 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0009 | 0.0026 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.00 |
| | | | Backup Generators | 50 | 0.9 | 0.0000 | 0.0000 | 0.0000 | 0.0 |
| | | | | 120 | 5.8 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 3.6 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 250 | 3.5 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 500 | 8.6 | 0.0006 | 0.0019 | 0.0001 | 0.0001 |
| | | | | 750 | 1.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.9 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 1500 | 1.9 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.8 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 3000 | 1.4 | 0.0008 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.6 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 3.8 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 2.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 2.3 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 500 | 5.6 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 750 | 0.7 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.3 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 1500 | 1.3 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.5 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.9 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| Mendocino County AQMD Total | 0 | 0 | 0 | | 51.5 | 0.0151 | 0.0442 | 0.0023 | 0.0039 |
| Modoc County APCD | Northeast Plateau | Modoc | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 2000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.6 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.4 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.9 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 750 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.6 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 750 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Modoc County APCD Total | 0 | 0 | 0 | | 5.5 | 0.0016 | 0.0047 | 0.0002 | 0.0004 |
| Mojave Desert AQMD | Mojave Desert | Riverside | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/da | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CO | NOx | PM | ROG |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0001 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.7 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.7 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.7 | 0.0001 | 0.0004 | 0.0000 | [illegible] |
| | | | | 750 | 0.2 | 0.0000 | 0.0001 | 0.0000 | [illegible] |
| | | | | 1000 | 0.4 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.4 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.3 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.8 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.5 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.5 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 750 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | San Bernardino | Prime Generators | 50 | 0.2 | 0.0001 | 0.0001 | 0.0000 | 0.0001 |
| | | | | 120 | 1.4 | 0.0012 | 0.0030 | 0.0003 | 0.0004 |
| | | | | 175 | 0.9 | 0.0011 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 250 | 0.8 | 0.0014 | 0.0042 | 0.0002 | 0.0004 |
| | | | | 500 | 2.1 | 0.0048 | 0.0153 | 0.0008 | 0.0013 |
| | | | | 750 | 0.3 | 0.0011 | 0.0033 | 0.0002 | 0.0003 |
| | | | | 1000 | 0.5 | 0.0033 | 0.0093 | 0.0005 | 0.0008 |
| | | | | 1500 | 0.5 | 0.0046 | 0.0130 | 0.0007 | 0.0012 |
| | | | | 2000 | 0.2 | 0.0028 | 0.0079 | 0.0004 | 0.0007 |
| | | | | 3000 | 0.3 | 0.0063 | 0.0180 | 0.0009 | 0.0016 |
| | | | | 10000 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | Prime Pumps | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | [illegible] |
| | | | | 120 | 0.9 | 0.0008 | 0.0019 | 0.0002 | [illegible] |
| | | | | 175 | 0.6 | 0.0007 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 250 | 0.5 | 0.0008 | 0.0026 | 0.0002 | 0.0002 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 500 | 1.4 | 0.0032 | 0.0102 | 0.0006 | 0.0009 |
| | | | | 750 | 0.2 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.3 | 0.0021 | 0.0061 | 0.0003 | 0.0005 |
| | | | | 1500 | 0.3 | 0.0030 | 0.0084 | 0.0004 | 0.0008 |
| | | | | 2000 | 0.1 | 0.0018 | 0.0051 | 0.0003 | 0.0005 |
| | | | | 3000 | 0.2 | 0.0041 | 0.0117 | 0.0006 | 0.0011 |
| | | | | 10000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 4.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 26.5 | 0.0006 | 0.0016 | 0.0001 | 0.0002 |
| | | | | 175 | 16.5 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 250 | 15.9 | 0.0007 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 500 | 39.5 | 0.0027 | 0.0088 | 0.0004 | 0.0007 |
| | | | | 750 | 5.2 | 0.0006 | 0.0019 | 0.0001 | 0.0001 |
| | | | | 1000 | 8.9 | 0.0018 | 0.0053 | 0.0003 | 0.0004 |
| | | | | 1500 | 8.9 | 0.0025 | 0.0074 | 0.0004 | 0.0006 |
| | | | | 2000 | 3.9 | 0.0015 | 0.0045 | 0.0002 | 0.0004 |
| | | | | 3000 | 6.2 | 0.0035 | 0.0103 | 0.0005 | 0.0008 |
| | | | | 10000 | 0.2 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | Backup Pumps | 50 | 2.7 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 17.3 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 175 | 10.8 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 250 | 10.4 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 500 | 25.7 | 0.0018 | 0.0059 | 0.0003 | 0.0005 |
| | | | | 750 | 3.4 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 1000 | 5.8 | 0.0012 | 0.0034 | 0.0002 | 0.0003 |
| | | | | 1500 | 5.8 | 0.0016 | 0.0048 | 0.0002 | 0.0004 |
| | | | | 2000 | 2.5 | 0.0010 | 0.0029 | 0.0001 | 0.0002 |
| | | | | 3000 | 4.1 | 0.0022 | 0.0067 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.1 | 0.0002 | 0.0004 | 0.0000 | 0.0000 |
| Mojave Desert AQMD Total | 0 | 0 | 0 | | 246.5 | 0.0722 | 0.2116 | 0.0110 | 0.0186 |
| Monterey Bay Unified APCD | North Central Coast | Monterey | Prime Generators | 50 | 0.2 | 0.0001 | 0.0001 | 0.0000 | 0.0001 |
| | | | | 120 | 1.4 | 0.0012 | 0.0030 | 0.0003 | 0.0004 |
| | | | | 175 | 0.9 | 0.0011 | 0.0031 | 0.0002 | 0.0003 |
| | | | | 250 | 0.9 | 0.0014 | 0.0043 | 0.0003 | 0.0004 |
| | | | | 500 | 2.1 | 0.0050 | 0.0156 | 0.0008 | 0.0013 |
| | | | | 750 | 0.3 | 0.0011 | 0.0034 | 0.0002 | 0.0003 |
| | | | | 1000 | 0.5 | 0.0033 | 0.0095 | 0.0005 | 0.0009 |
| | | | | 1500 | 0.5 | 0.0047 | 0.0133 | 0.0007 | 0.0012 |
| | | | | 2000 | 0.2 | 0.0028 | 0.0080 | 0.0004 | 0.0007 |
| | | | | 3000 | 0.3 | 0.0065 | 0.0184 | 0.0009 | 0.0017 |
| | | | | 10000 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | Prime Pumps | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.9 | 0.0008 | 0.0020 | 0.0002 | 0.0003 |
| | | | | 175 | 0.6 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 250 | 0.6 | 0.0009 | 0.0027 | 0.0002 | 0.0002 |
| | | | | 500 | 1.4 | 0.0033 | 0.0104 | 0.0006 | 0.0009 |
| | | | | 750 | 0.2 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.3 | 0.0022 | 0.0062 | 0.0003 | 0.0006 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day | | | |
| | | | | 1500 | 0.3 | 0.0030 | 0.0086 | 0.0004 | 0.0008 |
| | | | | 2000 | 0.1 | 0.0018 | 0.0052 | 0.0003 | 0.0005 |
| | | | | 3000 | 0.2 | 0.0042 | 0.0120 | 0.0006 | 0.0011 |
| | | | | 10000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0013 | 0.0042 | 0.0002 | 0.0003 |
| | | | | 500 | 1.0 | 0.0013 | 0.0042 | 0.0002 | 0.0003 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 4.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 27.1 | 0.0006 | 0.0016 | 0.0001 | 0.0002 |
| | | | | 175 | 16.9 | 0.0006 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 250 | 16.3 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 500 | 40.4 | 0.0028 | 0.0091 | 0.0004 | 0.0007 |
| | | | | 750 | 5.4 | 0.0006 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 1000 | 9.1 | 0.0018 | 0.0054 | 0.0003 | 0.0004 |
| | | | | 1500 | 9.1 | 0.0025 | 0.0076 | 0.0004 | 0.0006 |
| | | | | 2000 | 3.9 | 0.0015 | 0.0046 | 0.0002 | 0.0004 |
| | | | | 3000 | 6.4 | 0.0035 | 0.0105 | 0.0005 | [illegible] |
| | | | | 10000 | 0.2 | 0.0002 | 0.0007 | 0.0000 | [illegible] |
| | | | Backup Pumps | 50 | 2.7 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 120 | 17.7 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 175 | 11.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 250 | 10.6 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 500 | 26.3 | 0.0019 | 0.0060 | 0.0003 | 0.0005 |
| | | | | 750 | 3.5 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 1000 | 5.9 | 0.0012 | 0.0035 | 0.0002 | 0.0003 |
| | | | | 1500 | 5.9 | 0.0017 | 0.0049 | 0.0002 | 0.0004 |
| | | | | 2000 | 2.6 | 0.0010 | 0.0030 | 0.0001 | 0.0002 |
| | | | | 3000 | 4.2 | 0.0023 | 0.0068 | 0.0003 | 0.0006 |
| | | | | 10000 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | San Benito | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.2 | 0.0002 | 0.0004 | 0.0000 | 0.0001 |
| | | | | 175 | 0.1 | 0.0002 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 500 | 0.3 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 750 | 0.0 | 0.0001 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.1 | 0.0005 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 1500 | 0.1 | 0.0006 | 0.0018 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0009 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 500 | 0.2 | 0.0004 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | [illegible] |
| | | | | 1500 | 0.0 | 0.0004 | 0.0012 | 0.0001 | [illegible] |
| | | | | 2000 | 0.0 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.6 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 3.7 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 2.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 2.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 500 | 5.5 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 750 | 0.7 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.2 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 1500 | 1.2 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.5 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.9 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 2.4 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 1.5 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 1.4 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 3.6 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 750 | 0.5 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.8 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.8 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.3 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.6 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | Santa Cruz | Prime Generators | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.9 | 0.0008 | 0.0019 | 0.0002 | 0.0003 |
| | | | | 175 | 0.6 | 0.0007 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 250 | 0.5 | 0.0009 | 0.0027 | 0.0002 | 0.0002 |
| | | | | 500 | 1.3 | 0.0031 | 0.0098 | 0.0005 | 0.0008 |
| | | | | 750 | 0.2 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.3 | 0.0021 | 0.0060 | 0.0003 | 0.0005 |
| | | | | 1500 | 0.3 | 0.0029 | 0.0083 | 0.0004 | 0.0007 |
| | | | | 2000 | 0.1 | 0.0018 | 0.0051 | 0.0003 | 0.0005 |
| | | | | 3000 | 0.2 | 0.0041 | 0.0116 | 0.0006 | 0.0010 |
| | | | | 10000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | Prime Pumps | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.6 | 0.0005 | 0.0012 | 0.0001 | 0.0002 |
| | | | | 175 | 0.4 | 0.0005 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 250 | 0.4 | 0.0005 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 500 | 0.9 | 0.0021 | 0.0066 | 0.0004 | 0.0005 |
| | | | | 750 | 0.1 | 0.0004 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.2 | 0.0014 | 0.0039 | 0.0002 | 0.0003 |
| | | | | 1500 | 0.2 | 0.0019 | 0.0054 | 0.0003 | 0.0005 |
| | | | | 2000 | 0.1 | 0.0012 | 0.0033 | 0.0002 | 0.0003 |
| | | | | 3000 | 0.1 | 0.0026 | 0.0075 | 0.0004 | 0.0007 |
| | | | | 10000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 2.6 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 17.1 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 175 | 10.6 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 250 | 10.3 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 500 | 25.4 | 0.0018 | 0.0057 | 0.0003 | 0.0004 |
| | | | | 750 | 3.4 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 1000 | 5.7 | 0.0011 | 0.0034 | 0.0002 | 0.0003 |
| | | | | 1500 | 5.7 | 0.0016 | 0.0048 | 0.0002 | 0.0004 |
| | | | | 2000 | 2.5 | 0.0010 | 0.0029 | 0.0001 | 0.0002 |
| | | | | 3000 | 4.0 | 0.0022 | 0.0066 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 1.7 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 11.1 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 175 | 6.9 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 250 | 6.7 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 500 | 16.5 | 0.0012 | 0.0038 | 0.0002 | 0.0003 |
| | | | | 750 | 2.2 | 0.0002 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 1000 | 3.7 | 0.0007 | 0.0022 | 0.0001 | [illegible] |
| | | | | 1500 | 3.7 | 0.0010 | 0.0031 | 0.0001 | [illegible] |
| | | | | 2000 | 1.6 | 0.0006 | 0.0019 | 0.0001 | [illegible] |
| | | | | 3000 | 2.6 | 0.0014 | 0.0043 | 0.0002 | 0.0004 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| Monterey Bay Unified APCD Total | 0 | 0 | 0 | | 427.2 | 0.1275 | 0.3744 | 0.0195 | 0.0328 |
| North Coast Unified APCD | North Coast | Del Norte | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0003 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 750 | 0.0 | 0.0000 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.8 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 1.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 1.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 2.7 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 750 | 0.4 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.6 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.6 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.3 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.4 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.7 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.7 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.8 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 750 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.4 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.4 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.3 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | Humboldt | Prime Generators | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.4 | 0.0004 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 175 | 0.3 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 250 | 0.3 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 500 | 0.7 | 0.0015 | 0.0048 | 0.0003 | 0.0004 |
| | | | | 750 | 0.1 | 0.0003 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0010 | 0.0029 | 0.0001 | 0.0003 |
| | | | | 1500 | 0.1 | 0.0014 | 0.0041 | 0.0002 | 0.0004 |
| | | | | 2000 | 0.1 | 0.0009 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0020 | 0.0057 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.3 | 0.0002 | 0.0006 | 0.0001 | 0.0001 |
| | | | | 175 | 0.2 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 250 | 0.2 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 500 | 0.4 | 0.0010 | 0.0032 | 0.0002 | 0.0003 |
| | | | | 750 | 0.1 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0007 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 1500 | 0.1 | 0.0009 | 0.0027 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.1 | 0.0013 | 0.0037 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 1.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 8.4 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 175 | 5.2 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 250 | 5.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 500 | 12.5 | 0.0009 | 0.0028 | 0.0001 | 0.0002 |
| | | | | 750 | 1.7 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 1000 | 2.8 | 0.0006 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 1500 | 2.8 | 0.0008 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 2000 | 1.2 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 3000 | 2.0 | 0.0011 | 0.0032 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.8 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 5.5 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 3.4 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 3.3 | 0.0001 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 500 | 8.1 | 0.0006 | 0.0019 | 0.0001 | 0.0001 |
| | | | | 750 | 1.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.8 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1500 | 1.8 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.8 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 3000 | 1.3 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | Trinity | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.[illegible] |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0[illegible] |
| | | | | 250 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0[illegible] |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0[illegible] |
| | | | Backup Generators | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 120 | 0.9 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.5 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.5 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.3 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 750 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.6 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.8 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 750 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| North Coast Unified APCD Total | 0 | 0 | 0 | | 98.7 | 0.0289 | 0.0848 | 0.0044 | 0.0074 |
| Northern Sierra AQMD | Mountain Counties | Nevada | Prime Generators | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.3 | 0.0003 | 0.0007 | 0.0001 | 0.0001 |
| | | | | 175 | 0.2 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 250 | 0.2 | 0.0003 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 500 | 0.5 | 0.0012 | 0.0036 | 0.0002 | 0.0003 |
| | | | | 750 | 0.1 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0008 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 1500 | 0.1 | 0.0011 | 0.0031 | 0.0002 | 0.0003 |
| | | | | 2000 | 0.0 | 0.0007 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0015 | 0.0043 | 0.0002 | 0.0004 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.2 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 175 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 500 | 0.3 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 750 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.1 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 1500 | 0.1 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.1 | 0.0010 | 0.0028 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0003 | 0.0003 | 0.0000 | 0.0001 |
| | | | | 50 | 0.8 | 0.0003 | 0.0003 | 0.0000 | 0.0001 |
| | | | | 120 | 0.0 | 0.0010 | 0.0025 | 0.0003 | 0.0003 |
| | | | | 120 | 0.8 | 0.0010 | 0.0025 | 0.0003 | 0.0003 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0024 | 0.0075 | 0.0004 | 0.0006 |
| | | | | 500 | 0.8 | 0.0024 | 0.0075 | 0.0004 | 0.0006 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | Backup Generators | 50 | 1.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 6.3 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 175 | 3.9 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 250 | 3.8 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 500 | 9.4 | 0.0006 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 750 | 1.2 | 0.0001 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1000 | 2.1 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 1500 | 2.1 | 0.0006 | 0.0018 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.9 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 3000 | 1.5 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.6 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 4.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 2.6 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 2.5 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 500 | 6.1 | 0.0004 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 750 | 0.8 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.4 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 1500 | 1.4 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.6 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 3000 | 1.0 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | Plumas | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0001 | 0.0002 | 0.0000 | [illegible] |
| | | | | 250 | 0.0 | 0.0001 | 0.0002 | 0.0000 | [illegible] |
| | | | | 500 | 0.1 | 0.0003 | 0.0008 | 0.0000 | [illegible] |
| | | | | 750 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0002 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 50 | 0.2 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0002 | 0.0005 | 0.0001 | 0.0001 |
| | | | | 120 | 0.2 | 0.0002 | 0.0005 | 0.0001 | 0.0001 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0005 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 500 | 0.2 | 0.0005 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | Backup Generators | 50 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.4 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.9 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.8 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 2.1 | 0.0001 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 750 | 0.3 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.5 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.5 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.3 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.9 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.6 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.5 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.3 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 750 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.3 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | Sierra | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | Backup Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.3 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Northern Sierra AQMD Total | 0 | 0 | 0 | | 73.4 | 0.0299 | 0.0863 | 0.0049 | 0.0080 |
| Northern Sonoma County APCD | North Coast | Sonoma | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.2 | 0.0002 | 0.0004 | 0.0000 | 0.[illegible] |
| | | | | 175 | 0.1 | 0.0002 | 0.0004 | 0.0000 | 0.[illegible] |
| | | | | 250 | 0.1 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 500 | 0.3 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 750 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.1 | 0.0005 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 1500 | 0.1 | 0.0007 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0009 | 0.0026 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 500 | 0.2 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0006 | 0.0017 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.[illegible] |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.[illegible] |
| | | | Backup Generators | 50 | 0.6 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 120 | 3.8 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 2.4 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 2.3 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 500 | 5.7 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 750 | 0.8 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.3 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 1500 | 1.3 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.6 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.9 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 2.5 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 1.6 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 1.5 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 3.7 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 750 | 0.5 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.8 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.8 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.4 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.6 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| Northern Sonoma County APCD Total | 0 | 0 | 0 | | 34.1 | 0.0100 | 0.0293 | 0.0015 | 0.0026 |
| Placer County APCD | Lake Tahoe | Placer | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.9 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 175 | 0.5 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.5 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.3 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 750 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.6 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.8 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 750 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | Mountain Counties | | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0002 | 0.0000 | [illegible] |
| | | | | 1000 | 0.0 | 0.0002 | 0.0006 | 0.0000 | [illegible] |
| | | | | 1500 | 0.0 | 0.0003 | 0.0008 | 0.0000 | [illegible] |
| | | | | 2000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.6 | 0.0000 | 0.0001 | 0.0000 | [illegible] |
| | | | | 175 | 1.0 | 0.0000 | 0.0001 | 0.0000 | [illegible] |
| | | | | 250 | 1.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 2.4 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 750 | 0.3 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.5 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.5 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.4 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.6 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 0.6 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.5 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 750 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.3 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.2 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | Sacramento Valley | | Prime Generators | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.8 | 0.0007 | 0.0017 | 0.0002 | 0.0002 |
| | | | | 175 | 0.5 | 0.0006 | 0.0017 | 0.0001 | 0.0002 |
| | | | | 250 | 0.5 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 500 | 1.2 | 0.0028 | 0.0089 | 0.0005 | 0.0007 |
| | | | | 750 | 0.2 | 0.0006 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.3 | 0.0019 | 0.0054 | 0.0003 | 0.0005 |
| | | | | 1500 | 0.3 | 0.0026 | 0.0075 | 0.0004 | 0.0007 |
| | | | | 2000 | 0.1 | 0.0016 | 0.0046 | 0.0002 | 0.0004 |
| | | | | 3000 | 0.2 | 0.0037 | 0.0104 | 0.0005 | 0.0009 |
| | | | | 10000 | 0.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | Prime Pumps | 50 | 0.1 | 0.0001 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.5 | 0.0005 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 175 | 0.3 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 250 | 0.3 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 500 | 0.8 | 0.0019 | 0.0059 | 0.0003 | 0.0005 |
| | | | | 750 | 0.1 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.2 | 0.0012 | 0.0035 | 0.0002 | 0.0003 |
| | | | | 1500 | 0.2 | 0.0017 | 0.0049 | 0.0002 | 0.0004 |
| | | | | 2000 | 0.1 | 0.0010 | 0.0030 | 0.0001 | 0.0003 |
| | | | | 3000 | 0.1 | 0.0024 | 0.0068 | 0.0003 | 0.0006 |
| | | | | 10000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.9 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 2.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 15.4 | 0.0004 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 175 | 9.6 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 250 | 9.2 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 500 | 22.9 | 0.0016 | 0.0051 | 0.0002 | 0.0004 |
| | | | | 750 | 3.0 | 0.0003 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1000 | 5.1 | 0.0010 | 0.0031 | 0.0001 | 0.0003 |
| | | | | 1500 | 5.1 | 0.0014 | 0.0043 | 0.0002 | 0.0003 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 2000 | 2.2 | 0.0009 | 0.0026 | 0.0001 | 0.0002 |
| | | | | 3000 | 3.6 | 0.0020 | 0.0059 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 1.5 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 10.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 175 | 6.2 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 250 | 6.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 500 | 14.9 | 0.0011 | 0.0034 | 0.0002 | 0.0003 |
| | | | | 750 | 2.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 1000 | 3.3 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 1500 | 3.3 | 0.0009 | 0.0028 | 0.0001 | 0.0002 |
| | | | | 2000 | 1.5 | 0.0006 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 3000 | 2.4 | 0.0013 | 0.0039 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| Placer County APCD Total | 0 | 0 | 0 | | 159.7 | 0.0466 | 0.1365 | 0.0071 | 0.0120 |
| Sacramento Metropolitan AQMD | Sacramento Valley | Sacramento | Prime Generators | 50 | 0.7 | 0.0004 | 0.0004 | 0.0001 | 0.0002 |
| | | | | 120 | 4.5 | 0.0039 | 0.0096 | 0.0009 | 0.0013 |
| | | | | 175 | 2.8 | 0.0036 | 0.0097 | 0.0006 | 0.0010 |
| | | | | 250 | 2.7 | 0.0044 | 0.0135 | 0.0008 | 0.0012 |
| | | | | 500 | 6.7 | 0.0156 | 0.0492 | 0.0027 | 0.0041 |
| | | | | 750 | 0.9 | 0.0034 | 0.0108 | 0.0006 | 0.0009 |
| | | | | 1000 | 1.5 | 0.0105 | 0.0300 | 0.0015 | 0.0027 |
| | | | | 1500 | 1.5 | 0.0147 | 0.0418 | 0.0021 | 0.0037 |
| | | | | 2000 | 0.7 | 0.0089 | 0.0253 | 0.0013 | 0.0023 |
| | | | | 3000 | 1.1 | 0.0204 | 0.0580 | 0.0029 | 0.0052 |
| | | | | 10000 | 0.0 | 0.0014 | 0.0039 | 0.0002 | 0.00[illegible] |
| | | | Prime Pumps | 50 | 0.5 | 0.0003 | 0.0003 | 0.0000 | 0.0[illegible] |
| | | | | 120 | 2.9 | 0.0025 | 0.0062 | 0.0006 | 0.00[illegible] |
| | | | | 175 | 1.8 | 0.0023 | 0.0062 | 0.0004 | 0.0006 |
| | | | | 250 | 1.8 | 0.0027 | 0.0084 | 0.0005 | 0.0007 |
| | | | | 500 | 4.4 | 0.0104 | 0.0328 | 0.0018 | 0.0028 |
| | | | | 750 | 0.6 | 0.0022 | 0.0070 | 0.0004 | 0.0006 |
| | | | | 1000 | 1.0 | 0.0069 | 0.0195 | 0.0010 | 0.0017 |
| | | | | 1500 | 1.0 | 0.0096 | 0.0272 | 0.0014 | 0.0024 |
| | | | | 2000 | 0.4 | 0.0058 | 0.0165 | 0.0008 | 0.0015 |
| | | | | 3000 | 0.7 | 0.0133 | 0.0377 | 0.0019 | 0.0034 |
| | | | | 10000 | 0.0 | 0.0009 | 0.0025 | 0.0001 | 0.0002 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 120 | 1.0 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0020 | 0.0063 | 0.0004 | 0.0005 |
| | | | | 500 | 1.0 | 0.0020 | 0.0063 | 0.0004 | 0.0005 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 13.2 | 0.0001 | 0.0002 | 0.0000 | 0.0001 |
| | | | | 120 | 85.4 | 0.0020 | 0.0051 | 0.0004 | 0.0006 |
| | | | | 175 | 53.3 | 0.0019 | 0.0053 | 0.0003 | 0.0005 |
| | | | | 250 | 51.4 | 0.0024 | 0.0075 | 0.0004 | 0.0006 |
| | | | | 500 | 127.2 | 0.0088 | 0.0285 | 0.0013 | 0.0022 |
| | | | | 750 | 16.9 | 0.0019 | 0.0062 | 0.0003 | 0.0[illegible] |
| | | | | 1000 | 28.5 | 0.0058 | 0.0171 | 0.0008 | 0.0[illegible] |
| | | | | 1500 | 28.6 | 0.0080 | 0.0238 | 0.0011 | 0.0019 |
| | | | | 2000 | 12.4 | 0.0049 | 0.0144 | 0.0007 | 0.0012 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 3000 | 20.1 | 0.0111 | 0.0330 | 0.0016 | 0.0027 |
| | | | | 10000 | 0.7 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | Backup Pumps | 50 | 8.6 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 55.6 | 0.0013 | 0.0033 | 0.0002 | 0.0004 |
| | | | | 175 | 34.7 | 0.0012 | 0.0034 | 0.0002 | 0.0003 |
| | | | | 250 | 33.4 | 0.0015 | 0.0046 | 0.0002 | 0.0004 |
| | | | | 500 | 82.8 | 0.0059 | 0.0190 | 0.0009 | 0.0015 |
| | | | | 750 | 11.0 | 0.0013 | 0.0040 | 0.0002 | 0.0003 |
| | | | | 1000 | 18.6 | 0.0037 | 0.0111 | 0.0005 | 0.0009 |
| | | | | 1500 | 18.6 | 0.0052 | 0.0155 | 0.0007 | 0.0013 |
| | | | | 2000 | 8.1 | 0.0032 | 0.0094 | 0.0004 | 0.0008 |
| | | | | 3000 | 13.1 | 0.0072 | 0.0215 | 0.0010 | 0.0018 |
| | | | | 10000 | 0.5 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| Sacramento Metropolitan AQMD Total | 0 | 0 | 0 | | 762.7 | 0.2276 | 0.6676 | 0.0349 | 0.0586 |
| San Diego County APCD | San Diego | San Diego | Prime Generators | 50 | 1.6 | 0.0010 | 0.0008 | 0.0001 | 0.0004 |
| | | | | 120 | 10.2 | 0.0087 | 0.0216 | 0.0021 | 0.0029 |
| | | | | 175 | 6.3 | 0.0081 | 0.0219 | 0.0014 | 0.0022 |
| | | | | 250 | 6.1 | 0.0100 | 0.0306 | 0.0018 | 0.0027 |
| | | | | 500 | 15.1 | 0.0353 | 0.1113 | 0.0060 | 0.0093 |
| | | | | 750 | 2.0 | 0.0077 | 0.0243 | 0.0013 | 0.0021 |
| | | | | 1000 | 3.4 | 0.0238 | 0.0678 | 0.0034 | 0.0061 |
| | | | | 1500 | 3.4 | 0.0332 | 0.0945 | 0.0048 | 0.0085 |
| | | | | 2000 | 1.5 | 0.0201 | 0.0572 | 0.0029 | 0.0051 |
| | | | | 3000 | 2.4 | 0.0461 | 0.1312 | 0.0066 | 0.0118 |
| | | | | 10000 | 0.1 | 0.0031 | 0.0088 | 0.0004 | 0.0008 |
| | | | Prime Pumps | 50 | 1.0 | 0.0007 | 0.0006 | 0.0001 | 0.0003 |
| | | | | 120 | 6.6 | 0.0057 | 0.0141 | 0.0014 | 0.0019 |
| | | | | 175 | 4.1 | 0.0052 | 0.0141 | 0.0009 | 0.0014 |
| | | | | 250 | 4.0 | 0.0062 | 0.0189 | 0.0011 | 0.0017 |
| | | | | 500 | 9.9 | 0.0236 | 0.0742 | 0.0040 | 0.0062 |
| | | | | 750 | 1.3 | 0.0050 | 0.0158 | 0.0009 | 0.0013 |
| | | | | 1000 | 2.2 | 0.0155 | 0.0441 | 0.0022 | 0.0040 |
| | | | | 1500 | 2.2 | 0.0216 | 0.0615 | 0.0031 | 0.0055 |
| | | | | 2000 | 1.0 | 0.0131 | 0.0373 | 0.0019 | 0.0033 |
| | | | | 3000 | 1.6 | 0.0300 | 0.0854 | 0.0043 | 0.0077 |
| | | | | 10000 | 0.1 | 0.0020 | 0.0057 | 0.0003 | 0.0005 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0020 | 0.0050 | 0.0005 | 0.0007 |
| | | | | 120 | 1.0 | 0.0020 | 0.0050 | 0.0005 | 0.0007 |
| | | | | 120 | 4.0 | 0.0020 | 0.0050 | 0.0005 | 0.0007 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0066 | 0.0208 | 0.0011 | 0.0017 |
| | | | | 500 | 1.0 | 0.0066 | 0.0208 | 0.0011 | 0.0017 |
| | | | | 500 | 4.0 | 0.0066 | 0.0208 | 0.0011 | 0.0017 |
| | | | | 750 | 0.0 | 0.0036 | 0.0114 | 0.0006 | 0.0010 |
| | | | | 750 | 1.0 | 0.0036 | 0.0114 | 0.0006 | 0.0010 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 29.8 | 0.0003 | 0.0004 | 0.0001 | 0.0001 |
| | | | | 120 | 193.2 | 0.0045 | 0.0115 | 0.0008 | 0.0013 |
| | | | | 175 | 120.5 | 0.0043 | 0.0120 | 0.0006 | 0.0011 |
| | | | | 250 | 116.2 | 0.0054 | 0.0169 | 0.0008 | 0.0014 |
| | | | | 500 | 287.8 | 0.0199 | 0.0645 | 0.0029 | 0.0050 |
| | | | | 750 | 38.2 | 0.0044 | 0.0141 | 0.0006 | 0.0011 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

| Revised September 10, 2003, 2003 | | | | | | Emissions (tons/day | | | |
|---|---|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
| | | | | 1000 | 64.6 | 0.0130 | 0.0386 | 0.0019 | 0.0032 |
| | | | | 1500 | 64.7 | 0.0181 | 0.0539 | 0.0026 | 0.0044 |
| | | | | 2000 | 28.1 | 0.0110 | 0.0326 | 0.0016 | 0.0027 |
| | | | | 3000 | 45.5 | 0.0252 | 0.0747 | 0.0036 | 0.0061 |
| | | | | 10000 | 1.6 | 0.0017 | 0.0050 | 0.0002 | 0.0004 |
| | | | Backup Pumps | 50 | 19.4 | 0.0002 | 0.0003 | 0.0000 | 0.0001 |
| | | | | 120 | 125.7 | 0.0029 | 0.0075 | 0.0006 | 0.0009 |
| | | | | 175 | 78.4 | 0.0027 | 0.0077 | 0.0004 | 0.0007 |
| | | | | 250 | 75.6 | 0.0033 | 0.0104 | 0.0005 | 0.0008 |
| | | | | 500 | 187.3 | 0.0133 | 0.0430 | 0.0019 | 0.0033 |
| | | | | 750 | 24.9 | 0.0028 | 0.0091 | 0.0004 | 0.0007 |
| | | | | 1000 | 42.0 | 0.0085 | 0.0251 | 0.0012 | 0.0021 |
| | | | | 1500 | 42.1 | 0.0118 | 0.0350 | 0.0017 | 0.0029 |
| | | | | 2000 | 18.3 | 0.0072 | 0.0212 | 0.0010 | 0.0017 |
| | | | | 3000 | 29.6 | 0.0164 | 0.0486 | 0.0023 | 0.0040 |
| | | | | 10000 | 1.0 | 0.0011 | 0.0032 | 0.0002 | 0.0003 |
| San Diego County APCD Total | 0 | 0 | 0 | | 1731.6 | 0.5371 | 1.5774 | 0.0830 | 0.1388 |
| San Joaquin Valley Unified APCD | San Joaquin Valley | Fresno | Prime Generators | 50 | 0.4 | 0.0003 | 0.0002 | 0.0000 | 0.0001 |
| | | | | 120 | 2.9 | 0.0025 | 0.0062 | 0.0006 | 0.0008 |
| | | | | 175 | 1.8 | 0.0023 | 0.0062 | 0.0004 | 0.0006 |
| | | | | 250 | 1.7 | 0.0028 | 0.0087 | 0.0005 | 0.0008 |
| | | | | 500 | 4.3 | 0.0101 | 0.0317 | 0.0017 | 0.0027 |
| | | | | 750 | 0.6 | 0.0022 | 0.0069 | 0.0004 | 0.0006 |
| | | | | 1000 | 1.0 | 0.0068 | 0.0193 | 0.0010 | 0.0017 |
| | | | | 1500 | 1.0 | 0.0095 | 0.0269 | 0.0014 | 0.0024 |
| | | | | 2000 | 0.4 | 0.0057 | 0.0163 | 0.0008 | [illegible] |
| | | | | 3000 | 0.7 | 0.0131 | 0.0373 | 0.0019 | [illegible] |
| | | | | 10000 | 0.0 | 0.0009 | 0.0025 | 0.0001 | 0.0002 |
| | | | Prime Pumps | 50 | 0.3 | 0.0002 | 0.0002 | 0.0000 | 0.0001 |
| | | | | 120 | 1.9 | 0.0016 | 0.0040 | 0.0004 | 0.0005 |
| | | | | 175 | 1.2 | 0.0015 | 0.0040 | 0.0003 | 0.0004 |
| | | | | 250 | 1.1 | 0.0018 | 0.0054 | 0.0003 | 0.0005 |
| | | | | 500 | 2.8 | 0.0067 | 0.0211 | 0.0011 | 0.0018 |
| | | | | 750 | 0.4 | 0.0014 | 0.0045 | 0.0002 | 0.0004 |
| | | | | 1000 | 0.6 | 0.0044 | 0.0126 | 0.0006 | 0.0011 |
| | | | | 1500 | 0.6 | 0.0062 | 0.0175 | 0.0009 | 0.0016 |
| | | | | 2000 | 0.3 | 0.0037 | 0.0106 | 0.0005 | 0.0010 |
| | | | | 3000 | 0.4 | 0.0085 | 0.0243 | 0.0012 | 0.0022 |
| | | | | 10000 | 0.0 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0012 | 0.0030 | 0.0003 | 0.0004 |
| | | | | 120 | 0.5 | 0.0012 | 0.0030 | 0.0003 | 0.0004 |
| | | | | 120 | 2.0 | 0.0012 | 0.0030 | 0.0003 | 0.0004 |
| | | | | 175 | 0.0 | 0.0011 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 175 | 0.5 | 0.0011 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 175 | 1.2 | 0.0011 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 250 | 0.0 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 250 | 0.2 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 500 | 0.0 | 0.0060 | 0.0187 | 0.0010 | 0.0016 |
| | | | | 500 | 1.7 | 0.0060 | 0.0187 | 0.0010 | 0.0016 |
| | | | | 500 | 2.2 | 0.0060 | 0.0187 | 0.0010 | 0.0016 |
| | | | | 750 | 0.0 | 0.0013 | 0.0041 | 0.0002 | 0.0004 |
| | | | | 750 | 0.2 | 0.0013 | 0.0041 | 0.0002 | 0.0004 |
| | | | | 1000 | 0.0 | 0.0014 | 0.0040 | 0.0002 | 0.0003 |
| | | | | 1000 | 0.5 | 0.0014 | 0.0040 | 0.0002 | 0.0003 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | Backup Generators | 50 | 8.5 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 55.0 | 0.0013 | 0.0033 | 0.0002 | 0.0004 |
| | | | | 175 | 34.3 | 0.0012 | 0.0034 | 0.0002 | 0.0003 |
| | | | | 250 | 33.1 | 0.0015 | 0.0048 | 0.0002 | 0.0004 |
| | | | | 500 | 81.9 | 0.0057 | 0.0184 | 0.0008 | 0.0014 |
| | | | | 750 | 10.9 | 0.0012 | 0.0040 | 0.0002 | 0.0003 |
| | | | | 1000 | 18.4 | 0.0037 | 0.0110 | 0.0005 | 0.0009 |
| | | | | 1500 | 18.4 | 0.0052 | 0.0153 | 0.0007 | 0.0013 |
| | | | | 2000 | 8.0 | 0.0031 | 0.0093 | 0.0004 | 0.0008 |
| | | | | 3000 | 12.9 | 0.0072 | 0.0213 | 0.0010 | 0.0017 |
| | | | | 10000 | 0.4 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | Backup Pumps | 50 | 5.5 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 35.8 | 0.0008 | 0.0021 | 0.0002 | 0.0002 |
| | | | | 175 | 22.3 | 0.0008 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 250 | 21.5 | 0.0009 | 0.0030 | 0.0001 | 0.0002 |
| | | | | 500 | 53.3 | 0.0038 | 0.0122 | 0.0005 | 0.0009 |
| | | | | 750 | 7.1 | 0.0008 | 0.0026 | 0.0001 | 0.0002 |
| | | | | 1000 | 12.0 | 0.0024 | 0.0072 | 0.0003 | 0.0006 |
| | | | | 1500 | 12.0 | 0.0034 | 0.0100 | 0.0005 | 0.0008 |
| | | | | 2000 | 5.2 | 0.0020 | 0.0060 | 0.0003 | 0.0005 |
| | | | | 3000 | 8.4 | 0.0047 | 0.0138 | 0.0007 | 0.0011 |
| | | | | 10000 | 0.3 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | Kern | Prime Generators | 50 | 0.3 | 0.0002 | 0.0002 | 0.0000 | 0.0001 |
| | | | | 120 | 2.0 | 0.0017 | 0.0043 | 0.0004 | 0.0006 |
| | | | | 175 | 1.3 | 0.0016 | 0.0043 | 0.0003 | 0.0004 |
| | | | | 250 | 1.2 | 0.0020 | 0.0060 | 0.0004 | 0.0005 |
| | | | | 500 | 3.0 | 0.0070 | 0.0220 | 0.0012 | 0.0018 |
| | | | | 750 | 0.4 | 0.0015 | 0.0048 | 0.0003 | 0.0004 |
| | | | | 1000 | 0.7 | 0.0047 | 0.0134 | 0.0007 | 0.0012 |
| | | | | 1500 | 0.7 | 0.0066 | 0.0186 | 0.0009 | 0.0017 |
| | | | | 2000 | 0.3 | 0.0040 | 0.0113 | 0.0006 | 0.0010 |
| | | | | 3000 | 0.5 | 0.0091 | 0.0259 | 0.0013 | 0.0023 |
| | | | | 10000 | 0.0 | 0.0006 | 0.0017 | 0.0001 | 0.0002 |
| | | | Prime Pumps | 50 | 0.2 | 0.0001 | 0.0001 | 0.0000 | 0.0001 |
| | | | | 120 | 1.3 | 0.0011 | 0.0028 | 0.0003 | 0.0004 |
| | | | | 175 | 0.8 | 0.0010 | 0.0028 | 0.0002 | 0.0003 |
| | | | | 250 | 0.8 | 0.0012 | 0.0037 | 0.0002 | 0.0003 |
| | | | | 500 | 1.9 | 0.0046 | 0.0146 | 0.0008 | 0.0012 |
| | | | | 750 | 0.3 | 0.0010 | 0.0031 | 0.0002 | 0.0003 |
| | | | | 1000 | 0.4 | 0.0031 | 0.0087 | 0.0004 | 0.0008 |
| | | | | 1500 | 0.4 | 0.0043 | 0.0121 | 0.0006 | 0.0011 |
| | | | | 2000 | 0.2 | 0.0026 | 0.0073 | 0.0004 | 0.0007 |
| | | | | 3000 | 0.3 | 0.0059 | 0.0168 | 0.0008 | 0.0015 |
| | | | | 10000 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0008 | 0.0021 | 0.0002 | 0.0003 |
| | | | | 120 | 0.3 | 0.0008 | 0.0021 | 0.0002 | 0.0003 |
| | | | | 120 | 1.4 | 0.0008 | 0.0021 | 0.0002 | 0.0003 |
| | | | | 175 | 0.0 | 0.0008 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 175 | 0.3 | 0.0008 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 175 | 0.9 | 0.0008 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 250 | 0.0 | 0.0003 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 250 | 0.2 | 0.0003 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 500 | 0.0 | 0.0055 | 0.0172 | 0.0009 | 0.0015 |
| | | | | 500 | 1.0 | 0.0055 | 0.0172 | 0.0009 | 0.0015 |
| | | | | 500 | 1.2 | 0.0055 | 0.0172 | 0.0009 | 0.0015 |
| | | | | 500 | 1.5 | 0.0055 | 0.0172 | 0.0009 | 0.0015 |
| | | | | 750 | 0.0 | 0.0009 | 0.0029 | 0.0002 | 0.0002 |
| | | | | 750 | 0.2 | 0.0009 | 0.0029 | 0.0002 | 0.0002 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day | | | |
| | | | | 1000 | 0.0 | 0.0010 | 0.0027 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.3 | 0.0010 | 0.0027 | 0.0001 | 0.0002 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 5.9 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 38.1 | 0.0009 | 0.0023 | 0.0002 | 0.0003 |
| | | | | 175 | 23.8 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 250 | 22.9 | 0.0011 | 0.0033 | 0.0002 | 0.0003 |
| | | | | 500 | 56.8 | 0.0039 | 0.0127 | 0.0006 | 0.0010 |
| | | | | 750 | 7.5 | 0.0009 | 0.0028 | 0.0001 | 0.0002 |
| | | | | 1000 | 12.7 | 0.0026 | 0.0076 | 0.0004 | 0.0006 |
| | | | | 1500 | 12.8 | 0.0036 | 0.0106 | 0.0005 | 0.0009 |
| | | | | 2000 | 5.5 | 0.0022 | 0.0064 | 0.0003 | 0.0005 |
| | | | | 3000 | 9.0 | 0.0050 | 0.0147 | 0.0007 | 0.0012 |
| | | | | 10000 | 0.3 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | Backup Pumps | 50 | 3.8 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 24.8 | 0.0006 | 0.0015 | 0.0001 | 0.0002 |
| | | | | 175 | 15.5 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 250 | 14.9 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 500 | 36.9 | 0.0026 | 0.0085 | 0.0004 | 0.0007 |
| | | | | 750 | 4.9 | 0.0006 | 0.0018 | 0.0001 | 0.0001 |
| | | | | 1000 | 8.3 | 0.0017 | 0.0050 | 0.0002 | 0.0004 |
| | | | | 1500 | 8.3 | 0.0023 | 0.0069 | 0.0003 | 0.0006 |
| | | | | 2000 | 3.6 | 0.0014 | 0.0042 | 0.0002 | 0.00[illegible] |
| | | | | 3000 | 5.8 | 0.0032 | 0.0096 | 0.0005 | 0.[illegible] |
| | | | | 10000 | 0.2 | 0.0002 | 0.0006 | 0.0000 | 0.00[illegible] |
| | | Kings | Prime Generators | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.5 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 175 | 0.3 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 250 | 0.3 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 500 | 0.7 | 0.0016 | 0.0051 | 0.0003 | 0.0004 |
| | | | | 750 | 0.1 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.2 | 0.0011 | 0.0031 | 0.0002 | 0.0003 |
| | | | | 1500 | 0.2 | 0.0015 | 0.0043 | 0.0002 | 0.0004 |
| | | | | 2000 | 0.1 | 0.0009 | 0.0026 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0021 | 0.0060 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.3 | 0.0003 | 0.0006 | 0.0001 | 0.0001 |
| | | | | 175 | 0.2 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 250 | 0.2 | 0.0003 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 500 | 0.5 | 0.0011 | 0.0034 | 0.0002 | 0.0003 |
| | | | | 750 | 0.1 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 1500 | 0.1 | 0.0010 | 0.0028 | 0.0001 | 0.0003 |
| | | | | 2000 | 0.0 | 0.0006 | 0.0017 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0014 | 0.0039 | 0.0002 | 0.0004 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 120 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 120 | 0.3 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 175 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0[illegible] |
| | | | | 175 | 0.2 | 0.0002 | 0.0005 | 0.0000 | 0.0[illegible] |
| | | | | 250 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.000[illegible] |
| | | | | 250 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 500 | 0.0 | 0.0010 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 500 | 0.3 | 0.0010 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 500 | 0.4 | 0.0010 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 750 | 0.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 750 | 0.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 1000 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 1.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 8.9 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 175 | 5.5 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 250 | 5.3 | 0.0002 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 500 | 13.2 | 0.0009 | 0.0030 | 0.0001 | 0.0002 |
| | | | | 750 | 1.8 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 1000 | 3.0 | 0.0006 | 0.0018 | 0.0001 | 0.0001 |
| | | | | 1500 | 3.0 | 0.0008 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 2000 | 1.3 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 3000 | 2.1 | 0.0012 | 0.0034 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.9 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 5.8 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 3.6 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 250 | 3.5 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 500 | 8.6 | 0.0006 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 750 | 1.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.9 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 1500 | 1.9 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.8 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 3000 | 1.4 | 0.0008 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | Madera | Prime Generators | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.5 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 175 | 0.3 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 250 | 0.3 | 0.0004 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 500 | 0.7 | 0.0016 | 0.0050 | 0.0003 | 0.0004 |
| | | | | 750 | 0.1 | 0.0003 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.2 | 0.0011 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 1500 | 0.2 | 0.0015 | 0.0042 | 0.0002 | 0.0004 |
| | | | | 2000 | 0.1 | 0.0009 | 0.0026 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0021 | 0.0059 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.3 | 0.0003 | 0.0006 | 0.0001 | 0.0001 |
| | | | | 175 | 0.2 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 250 | 0.2 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 500 | 0.4 | 0.0011 | 0.0033 | 0.0002 | 0.0003 |
| | | | | 750 | 0.1 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 1500 | 0.1 | 0.0010 | 0.0028 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0006 | 0.0017 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0013 | 0.0038 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 120 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 120 | 0.3 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| | | | | | | Emissions (tons/day) | | | |
|---|---|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
| | | | | 175 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 175 | 0.2 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0009 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 500 | 0.3 | 0.0009 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 500 | 0.4 | 0.0009 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 750 | 0.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 750 | 0.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 1000 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 1.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 8.7 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 175 | 5.4 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 250 | 5.2 | 0.0002 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 500 | 12.9 | 0.0009 | 0.0029 | 0.0001 | 0.0002 |
| | | | | 750 | 1.7 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 1000 | 2.9 | 0.0006 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 1500 | 2.9 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 2000 | 1.3 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 3000 | 2.0 | 0.0011 | 0.0034 | 0.0002 | 0.00[illegible] |
| | | | | 10000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.[illegible] |
| | | | Backup Pumps | 50 | 0.9 | 0.0000 | 0.0000 | 0.0000 | 0.00[illegible] |
| | | | | 120 | 5.6 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 3.5 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 3.4 | 0.0001 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 500 | 8.4 | 0.0006 | 0.0019 | 0.0001 | 0.0001 |
| | | | | 750 | 1.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.9 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1500 | 1.9 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.8 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 3000 | 1.3 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | Merced | Prime Generators | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.8 | 0.0007 | 0.0016 | 0.0002 | 0.0002 |
| | | | | 175 | 0.5 | 0.0006 | 0.0017 | 0.0001 | 0.0002 |
| | | | | 250 | 0.5 | 0.0008 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 500 | 1.1 | 0.0027 | 0.0084 | 0.0005 | 0.0007 |
| | | | | 750 | 0.2 | 0.0006 | 0.0018 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.3 | 0.0018 | 0.0051 | 0.0003 | 0.0005 |
| | | | | 1500 | 0.3 | 0.0025 | 0.0072 | 0.0004 | 0.0006 |
| | | | | 2000 | 0.1 | 0.0015 | 0.0043 | 0.0002 | 0.0004 |
| | | | | 3000 | 0.2 | 0.0035 | 0.0100 | 0.0005 | 0.0009 |
| | | | | 10000 | 0.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | Prime Pumps | 50 | 0.1 | 0.0001 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.5 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 175 | 0.3 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 250 | 0.3 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 500 | 0.7 | 0.0018 | 0.0056 | 0.0003 | 0.0005 |
| | | | | 750 | 0.1 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.2 | 0.0012 | 0.0033 | 0.0002 | 0.0[illegible] |
| | | | | 1500 | 0.2 | 0.0016 | 0.0047 | 0.0002 | 0.[illegible] |
| | | | | 2000 | 0.1 | 0.0010 | 0.0028 | 0.0001 | 0.00[illegible] |
| | | | | 3000 | 0.1 | 0.0023 | 0.0065 | 0.0003 | 0.0006 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 10000 | 0.0 | 0.0002 | 0.0004 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0003 | 0.0008 | 0.0001 | 0.0001 |
| | | | | 120 | 0.1 | 0.0003 | 0.0008 | 0.0001 | 0.0001 |
| | | | | 120 | 0.5 | 0.0003 | 0.0008 | 0.0001 | 0.0001 |
| | | | | 175 | 0.0 | 0.0003 | 0.0008 | 0.0001 | 0.0001 |
| | | | | 175 | 0.1 | 0.0003 | 0.0008 | 0.0001 | 0.0001 |
| | | | | 175 | 0.3 | 0.0003 | 0.0008 | 0.0001 | 0.0001 |
| | | | | 250 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0016 | 0.0050 | 0.0003 | 0.0004 |
| | | | | 500 | 0.5 | 0.0016 | 0.0050 | 0.0003 | 0.0004 |
| | | | | 500 | 0.6 | 0.0016 | 0.0050 | 0.0003 | 0.0004 |
| | | | | 750 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 750 | 0.1 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 2.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 14.7 | 0.0003 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 175 | 9.1 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 250 | 8.8 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 500 | 21.8 | 0.0015 | 0.0049 | 0.0002 | 0.0004 |
| | | | | 750 | 2.9 | 0.0003 | 0.0011 | 0.0000 | 0.0001 |
| | | | | 1000 | 4.9 | 0.0010 | 0.0029 | 0.0001 | 0.0002 |
| | | | | 1500 | 4.9 | 0.0014 | 0.0041 | 0.0002 | 0.0003 |
| | | | | 2000 | 2.1 | 0.0008 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 3000 | 3.4 | 0.0019 | 0.0057 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 1.5 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 9.5 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 175 | 6.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 250 | 5.7 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 500 | 14.2 | 0.0010 | 0.0033 | 0.0001 | 0.0003 |
| | | | | 750 | 1.9 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 1000 | 3.2 | 0.0006 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 1500 | 3.2 | 0.0009 | 0.0027 | 0.0001 | 0.0002 |
| | | | | 2000 | 1.4 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 3000 | 2.2 | 0.0012 | 0.0037 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | San Joaquin | Prime Generators | 50 | 0.3 | 0.0002 | 0.0002 | 0.0000 | 0.0001 |
| | | | | 120 | 2.1 | 0.0018 | 0.0045 | 0.0004 | 0.0006 |
| | | | | 175 | 1.3 | 0.0017 | 0.0045 | 0.0003 | 0.0004 |
| | | | | 250 | 1.3 | 0.0021 | 0.0063 | 0.0004 | 0.0006 |
| | | | | 500 | 3.1 | 0.0073 | 0.0230 | 0.0012 | 0.0019 |
| | | | | 750 | 0.4 | 0.0016 | 0.0050 | 0.0003 | 0.0004 |
| | | | | 1000 | 0.7 | 0.0049 | 0.0140 | 0.0007 | 0.0013 |
| | | | | 1500 | 0.7 | 0.0069 | 0.0195 | 0.0010 | 0.0017 |
| | | | | 2000 | 0.3 | 0.0042 | 0.0118 | 0.0006 | 0.0011 |
| | | | | 3000 | 0.5 | 0.0095 | 0.0271 | 0.0014 | 0.0024 |
| | | | | 10000 | 0.0 | 0.0006 | 0.0018 | 0.0001 | 0.0002 |
| | | | Prime Pumps | 50 | 0.2 | 0.0001 | 0.0001 | 0.0000 | 0.0001 |
| | | | | 120 | 1.4 | 0.0012 | 0.0029 | 0.0003 | 0.0004 |
| | | | | 175 | 0.9 | 0.0011 | 0.0029 | 0.0002 | 0.0003 |
| | | | | 250 | 0.8 | 0.0013 | 0.0039 | 0.0002 | 0.0003 |
| | | | | 500 | 2.0 | 0.0049 | 0.0153 | 0.0008 | 0.0013 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 750 | 0.3 | 0.0010 | 0.0033 | 0.0002 | 0.0003 |
| | | | | 1000 | 0.5 | 0.0032 | 0.0091 | 0.0005 | 0.0008 |
| | | | | 1500 | 0.5 | 0.0045 | 0.0127 | 0.0006 | 0.0011 |
| | | | | 2000 | 0.2 | 0.0027 | 0.0077 | 0.0004 | 0.0007 |
| | | | | 3000 | 0.3 | 0.0062 | 0.0176 | 0.0009 | 0.0016 |
| | | | | 10000 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0009 | 0.0022 | 0.0002 | 0.0003 |
| | | | | 120 | 0.4 | 0.0009 | 0.0022 | 0.0002 | 0.0003 |
| | | | | 120 | 1.4 | 0.0009 | 0.0022 | 0.0002 | 0.0003 |
| | | | | 175 | 0.0 | 0.0008 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 175 | 0.4 | 0.0008 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 175 | 0.9 | 0.0008 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 250 | 0.0 | 0.0003 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 250 | 0.2 | 0.0003 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 500 | 0.0 | 0.0043 | 0.0136 | 0.0007 | 0.0012 |
| | | | | 500 | 1.3 | 0.0043 | 0.0136 | 0.0007 | 0.0012 |
| | | | | 500 | 1.6 | 0.0043 | 0.0136 | 0.0007 | 0.0012 |
| | | | | 750 | 0.0 | 0.0010 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 750 | 0.2 | 0.0010 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 1000 | 0.0 | 0.0010 | 0.0029 | 0.0001 | 0.0003 |
| | | | | 1000 | 0.4 | 0.0010 | 0.0029 | 0.0001 | 0.0003 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 6.2 | 0.0001 | 0.0001 | 0.0000 | 0.0[illegible] |
| | | | | 120 | 39.9 | 0.0009 | 0.0024 | 0.0002 | 0.00[illegible] |
| | | | | 175 | 24.9 | 0.0009 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 250 | 24.0 | 0.0011 | 0.0035 | 0.0002 | 0.0003 |
| | | | | 500 | 59.4 | 0.0041 | 0.0133 | 0.0006 | 0.0010 |
| | | | | 750 | 7.9 | 0.0009 | 0.0029 | 0.0001 | 0.0002 |
| | | | | 1000 | 13.3 | 0.0027 | 0.0080 | 0.0004 | 0.0007 |
| | | | | 1500 | 13.3 | 0.0037 | 0.0111 | 0.0005 | 0.0009 |
| | | | | 2000 | 5.8 | 0.0023 | 0.0067 | 0.0003 | 0.0005 |
| | | | | 3000 | 9.4 | 0.0052 | 0.0154 | 0.0007 | 0.0013 |
| | | | | 10000 | 0.3 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | Backup Pumps | 50 | 4.0 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 25.9 | 0.0006 | 0.0015 | 0.0001 | 0.0002 |
| | | | | 175 | 16.2 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 250 | 15.6 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 500 | 38.6 | 0.0027 | 0.0089 | 0.0004 | 0.0007 |
| | | | | 750 | 5.1 | 0.0006 | 0.0019 | 0.0001 | 0.0001 |
| | | | | 1000 | 8.7 | 0.0017 | 0.0052 | 0.0002 | 0.0004 |
| | | | | 1500 | 8.7 | 0.0024 | 0.0072 | 0.0003 | 0.0006 |
| | | | | 2000 | 3.8 | 0.0015 | 0.0044 | 0.0002 | 0.0004 |
| | | | | 3000 | 6.1 | 0.0034 | 0.0100 | 0.0005 | 0.0008 |
| | | | | 10000 | 0.2 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | Stanislaus | Prime Generators | 50 | 0.3 | 0.0002 | 0.0001 | 0.0000 | 0.0001 |
| | | | | 120 | 1.7 | 0.0014 | 0.0035 | 0.0003 | 0.0005 |
| | | | | 175 | 1.0 | 0.0013 | 0.0036 | 0.0002 | 0.0004 |
| | | | | 250 | 1.0 | 0.0016 | 0.0050 | 0.0003 | 0.0004 |
| | | | | 500 | 2.5 | 0.0057 | 0.0181 | 0.0010 | 0.0015 |
| | | | | 750 | 0.3 | 0.0013 | 0.0040 | 0.0002 | 0.0003 |
| | | | | 1000 | 0.6 | 0.0039 | 0.0110 | 0.0006 | 0.0010 |
| | | | | 1500 | 0.6 | 0.0054 | 0.0154 | 0.0008 | 0.0[illegible] |
| | | | | 2000 | 0.2 | 0.0033 | 0.0093 | 0.0005 | 0.0[illegible] |
| | | | | 3000 | 0.4 | 0.0075 | 0.0213 | 0.0011 | 0.0019 |
| | | | | 10000 | 0.0 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | Prime Pumps | 50 | 0.2 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 1.1 | 0.0009 | 0.0023 | 0.0002 | 0.0003 |
| | | | | 175 | 0.7 | 0.0008 | 0.0023 | 0.0002 | 0.0002 |
| | | | | 250 | 0.6 | 0.0010 | 0.0031 | 0.0002 | 0.0003 |
| | | | | 500 | 1.6 | 0.0038 | 0.0121 | 0.0007 | 0.0010 |
| | | | | 750 | 0.2 | 0.0008 | 0.0026 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.4 | 0.0025 | 0.0072 | 0.0004 | 0.0006 |
| | | | | 1500 | 0.4 | 0.0035 | 0.0100 | 0.0005 | 0.0009 |
| | | | | 2000 | 0.2 | 0.0021 | 0.0061 | 0.0003 | 0.0005 |
| | | | | 3000 | 0.3 | 0.0049 | 0.0139 | 0.0007 | 0.0012 |
| | | | | 10000 | 0.0 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0007 | 0.0017 | 0.0002 | 0.0002 |
| | | | | 120 | 0.3 | 0.0007 | 0.0017 | 0.0002 | 0.0002 |
| | | | | 120 | 1.1 | 0.0007 | 0.0017 | 0.0002 | 0.0002 |
| | | | | 175 | 0.0 | 0.0006 | 0.0017 | 0.0001 | 0.0002 |
| | | | | 175 | 0.3 | 0.0006 | 0.0017 | 0.0001 | 0.0002 |
| | | | | 175 | 0.7 | 0.0006 | 0.0017 | 0.0001 | 0.0002 |
| | | | | 250 | 0.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 250 | 0.1 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 500 | 0.0 | 0.0034 | 0.0107 | 0.0006 | 0.0009 |
| | | | | 500 | 1.0 | 0.0034 | 0.0107 | 0.0006 | 0.0009 |
| | | | | 500 | 1.3 | 0.0034 | 0.0107 | 0.0006 | 0.0009 |
| | | | | 750 | 0.0 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 750 | 0.1 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.0 | 0.0008 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.3 | 0.0008 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 4.8 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 31.4 | 0.0007 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 175 | 19.6 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 250 | 18.9 | 0.0009 | 0.0027 | 0.0001 | 0.0002 |
| | | | | 500 | 46.8 | 0.0032 | 0.0105 | 0.0005 | 0.0008 |
| | | | | 750 | 6.2 | 0.0007 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 1000 | 10.5 | 0.0021 | 0.0063 | 0.0003 | 0.0005 |
| | | | | 1500 | 10.5 | 0.0029 | 0.0088 | 0.0004 | 0.0007 |
| | | | | 2000 | 4.6 | 0.0018 | 0.0053 | 0.0003 | 0.0004 |
| | | | | 3000 | 7.4 | 0.0041 | 0.0121 | 0.0006 | 0.0010 |
| | | | | 10000 | 0.3 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | Backup Pumps | 50 | 3.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 20.4 | 0.0005 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 175 | 12.8 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 250 | 12.3 | 0.0005 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 500 | 30.4 | 0.0022 | 0.0070 | 0.0003 | 0.0005 |
| | | | | 750 | 4.0 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 1000 | 6.8 | 0.0014 | 0.0041 | 0.0002 | 0.0003 |
| | | | | 1500 | 6.8 | 0.0019 | 0.0057 | 0.0003 | 0.0005 |
| | | | | 2000 | 3.0 | 0.0012 | 0.0035 | 0.0002 | 0.0003 |
| | | | | 3000 | 4.8 | 0.0027 | 0.0079 | 0.0004 | 0.0006 |
| | | | | 10000 | 0.2 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | Tulare | Prime Generators | 50 | 0.2 | 0.0001 | 0.0001 | 0.0000 | 0.0001 |
| | | | | 120 | 1.3 | 0.0011 | 0.0028 | 0.0003 | 0.0004 |
| | | | | 175 | 0.8 | 0.0011 | 0.0028 | 0.0002 | 0.0003 |
| | | | | 250 | 0.8 | 0.0013 | 0.0040 | 0.0002 | 0.0004 |
| | | | | 500 | 2.0 | 0.0046 | 0.0145 | 0.0008 | 0.0012 |
| | | | | 750 | 0.3 | 0.0010 | 0.0032 | 0.0002 | 0.0003 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| | | | | | | Emissions (tons/day, | | | |
|---|---|---|---|---|---|---|---|---|---|
| **District** | **Air Basin** | **County** | **Equipment** | **Horsepower Class** | **Population** | **CO** | **NOx** | **PM** | **ROG** |
| | | | | 1000 | 0.4 | 0.0031 | 0.0088 | 0.0004 | 0.0008 |
| | | | | 1500 | 0.4 | 0.0043 | 0.0123 | 0.0006 | 0.0011 |
| | | | | 2000 | 0.2 | 0.0026 | 0.0075 | 0.0004 | 0.0007 |
| | | | | 3000 | 0.3 | 0.0060 | 0.0171 | 0.0009 | 0.0015 |
| | | | | 10000 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | Prime Pumps | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.9 | 0.0007 | 0.0018 | 0.0002 | 0.0002 |
| | | | | 175 | 0.5 | 0.0007 | 0.0018 | 0.0001 | 0.0002 |
| | | | | 250 | 0.5 | 0.0008 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 500 | 1.3 | 0.0031 | 0.0097 | 0.0005 | 0.0008 |
| | | | | 750 | 0.2 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.3 | 0.0020 | 0.0057 | 0.0003 | 0.0005 |
| | | | | 1500 | 0.3 | 0.0028 | 0.0080 | 0.0004 | 0.0007 |
| | | | | 2000 | 0.1 | 0.0017 | 0.0048 | 0.0002 | 0.0004 |
| | | | | 3000 | 0.2 | 0.0039 | 0.0111 | 0.0006 | 0.0010 |
| | | | | 10000 | 0.0 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0014 | 0.0035 | 0.0003 | 0.0005 |
| | | | | 120 | 0.2 | 0.0014 | 0.0035 | 0.0003 | 0.0005 |
| | | | | 120 | 0.9 | 0.0014 | 0.0035 | 0.0003 | 0.0005 |
| | | | | 120 | 2.0 | 0.0014 | 0.0035 | 0.0003 | 0.0005 |
| | | | | 175 | 0.0 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 175 | 0.2 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 175 | 0.6 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 250 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 250 | 0.1 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 500 | 0.0 | 0.0027 | 0.0086 | 0.0005 | 0.00[illegible] |
| | | | | 500 | 0.8 | 0.0027 | 0.0086 | 0.0005 | 0.0[illegible] |
| | | | | 500 | 1.0 | 0.0027 | 0.0086 | 0.0005 | 0.00[illegible] |
| | | | | 750 | 0.0 | 0.0006 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 750 | 0.1 | 0.0006 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.0 | 0.0006 | 0.0018 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.2 | 0.0006 | 0.0018 | 0.0001 | 0.0002 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 3.9 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 25.1 | 0.0006 | 0.0015 | 0.0001 | 0.0002 |
| | | | | 175 | 15.7 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 250 | 15.1 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 500 | 37.5 | 0.0026 | 0.0084 | 0.0004 | 0.0006 |
| | | | | 750 | 5.0 | 0.0006 | 0.0018 | 0.0001 | 0.0001 |
| | | | | 1000 | 8.4 | 0.0017 | 0.0050 | 0.0002 | 0.0004 |
| | | | | 1500 | 8.4 | 0.0024 | 0.0070 | 0.0003 | 0.0006 |
| | | | | 2000 | 3.7 | 0.0014 | 0.0042 | 0.0002 | 0.0003 |
| | | | | 3000 | 5.9 | 0.0033 | 0.0097 | 0.0005 | 0.0008 |
| | | | | 10000 | 0.2 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | Backup Pumps | 50 | 2.5 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 16.4 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 175 | 10.2 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 250 | 9.8 | 0.0004 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 500 | 24.4 | 0.0017 | 0.0056 | 0.0003 | 0.0004 |
| | | | | 750 | 3.2 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 1000 | 5.5 | 0.0011 | 0.0033 | 0.0002 | 0.0003 |
| | | | | 1500 | 5.5 | 0.0015 | 0.0046 | 0.0002 | 0.0004 |
| | | | | 2000 | 2.4 | 0.0009 | 0.0028 | 0.0001 | 0.00[illegible] |
| | | | | 3000 | 3.8 | 0.0021 | 0.0063 | 0.0003 | 0.00[illegible] |
| | | | | 10000 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| San Joaquin Valley Unified APCD Total | 0 | 0 | 0 | | 2014.4 | 0.7176 | 2.1107 | 0.1134 | 0.1868 |
| San Luis Obispo County APCD | South Central Coast | San Luis Obispo | Prime Generators | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.9 | 0.0008 | 0.0019 | 0.0002 | 0.0002 |
| | | | | 175 | 0.6 | 0.0007 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 250 | 0.5 | 0.0009 | 0.0027 | 0.0002 | 0.0002 |
| | | | | 500 | 1.3 | 0.0031 | 0.0097 | 0.0005 | 0.0008 |
| | | | | 750 | 0.2 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.3 | 0.0021 | 0.0059 | 0.0003 | 0.0005 |
| | | | | 1500 | 0.3 | 0.0029 | 0.0082 | 0.0004 | 0.0007 |
| | | | | 2000 | 0.1 | 0.0017 | 0.0050 | 0.0002 | 0.0004 |
| | | | | 3000 | 0.2 | 0.0040 | 0.0114 | 0.0006 | 0.0010 |
| | | | | 10000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | Prime Pumps | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.6 | 0.0005 | 0.0012 | 0.0001 | 0.0002 |
| | | | | 175 | 0.4 | 0.0005 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 250 | 0.3 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 500 | 0.9 | 0.0020 | 0.0064 | 0.0003 | 0.0005 |
| | | | | 750 | 0.1 | 0.0004 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.2 | 0.0013 | 0.0038 | 0.0002 | 0.0003 |
| | | | | 1500 | 0.2 | 0.0019 | 0.0053 | 0.0003 | 0.0005 |
| | | | | 2000 | 0.1 | 0.0011 | 0.0032 | 0.0002 | 0.0003 |
| | | | | 3000 | 0.1 | 0.0026 | 0.0074 | 0.0004 | 0.0007 |
| | | | | 10000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 2.6 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 16.8 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 175 | 10.5 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 250 | 10.1 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 500 | 25.0 | 0.0017 | 0.0056 | 0.0003 | 0.0004 |
| | | | | 750 | 3.3 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 1000 | 5.6 | 0.0011 | 0.0033 | 0.0002 | 0.0003 |
| | | | | 1500 | 5.6 | 0.0016 | 0.0047 | 0.0002 | 0.0004 |
| | | | | 2000 | 2.4 | 0.0010 | 0.0028 | 0.0001 | 0.0002 |
| | | | | 3000 | 3.9 | 0.0022 | 0.0065 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 1.7 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 10.9 | 0.0003 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 175 | 6.8 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 250 | 6.6 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 500 | 16.2 | 0.0012 | 0.0037 | 0.0002 | 0.0003 |
| | | | | 750 | 2.2 | 0.0002 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 1000 | 3.6 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 1500 | 3.6 | 0.0010 | 0.0030 | 0.0001 | 0.0002 |
| | | | | 2000 | 1.6 | 0.0006 | 0.0018 | 0.0001 | 0.0002 |
| | | | | 3000 | 2.6 | 0.0014 | 0.0042 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| San Luis Obispo County APCD Total | 0 | 0 | 0 | | 149.2 | 0.0437 | 0.1281 | 0.0067 | 0.0112 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| Santa Barbara County APCD | South Central Coast | Santa Barbara | Prime Generators | 50 | 0.2 | 0.0001 | 0.0001 | 0.0000 | 0.0001 |
| | | | | 120 | 1.4 | 0.0012 | 0.0030 | 0.0003 | 0.0004 |
| | | | | 175 | 0.9 | 0.0011 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 250 | 0.8 | 0.0014 | 0.0043 | 0.0003 | 0.0004 |
| | | | | 500 | 2.1 | 0.0049 | 0.0155 | 0.0008 | 0.0013 |
| | | | | 750 | 0.3 | 0.0011 | 0.0034 | 0.0002 | 0.0003 |
| | | | | 1000 | 0.5 | 0.0033 | 0.0094 | 0.0005 | 0.0008 |
| | | | | 1500 | 0.5 | 0.0046 | 0.0131 | 0.0007 | 0.0012 |
| | | | | 2000 | 0.2 | 0.0028 | 0.0080 | 0.0004 | 0.0007 |
| | | | | 3000 | 0.3 | 0.0064 | 0.0182 | 0.0009 | 0.0016 |
| | | | | 10000 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | Prime Pumps | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.9 | 0.0008 | 0.0020 | 0.0002 | 0.0003 |
| | | | | 175 | 0.6 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 250 | 0.6 | 0.0009 | 0.0026 | 0.0002 | 0.0002 |
| | | | | 500 | 1.4 | 0.0033 | 0.0103 | 0.0006 | 0.0009 |
| | | | | 750 | 0.2 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.3 | 0.0022 | 0.0061 | 0.0003 | 0.0005 |
| | | | | 1500 | 0.3 | 0.0030 | 0.0085 | 0.0004 | 0.0008 |
| | | | | 2000 | 0.1 | 0.0018 | 0.0052 | 0.0003 | 0.0005 |
| | | | | 3000 | 0.2 | 0.0042 | 0.0119 | 0.0006 | 0.0011 |
| | | | | 10000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.00[illegible] |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0[illegible] |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.00[illegible] |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 4.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 26.8 | 0.0006 | 0.0016 | 0.0001 | 0.0002 |
| | | | | 175 | 16.7 | 0.0006 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 250 | 16.1 | 0.0007 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 500 | 40.0 | 0.0028 | 0.0090 | 0.0004 | 0.0007 |
| | | | | 750 | 5.3 | 0.0006 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 1000 | 9.0 | 0.0018 | 0.0054 | 0.0003 | 0.0004 |
| | | | | 1500 | 9.0 | 0.0025 | 0.0075 | 0.0004 | 0.0006 |
| | | | | 2000 | 3.9 | 0.0015 | 0.0045 | 0.0002 | 0.0004 |
| | | | | 3000 | 6.3 | 0.0035 | 0.0104 | 0.0005 | 0.0008 |
| | | | | 10000 | 0.2 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | Backup Pumps | 50 | 2.7 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 17.5 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 175 | 10.9 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 250 | 10.5 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 500 | 26.0 | 0.0018 | 0.0060 | 0.0003 | 0.0005 |
| | | | | 750 | 3.5 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 1000 | 5.8 | 0.0012 | 0.0035 | 0.0002 | 0.0003 |
| | | | | 1500 | 5.8 | 0.0016 | 0.0049 | 0.0002 | 0.0004 |
| | | | | 2000 | 2.5 | 0.0010 | 0.0029 | 0.0001 | 0.0002 |
| | | | | 3000 | 4.1 | 0.0023 | 0.0068 | 0.0003 | 0.0006 |
| | | | | 10000 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| Santa Barbara County APCD Total | 0 | 0 | 0 | | 239.1 | 0.0700 | 0.2053 | 0.0107 | 0.0[illegible] |
| Shasta County AQMD | Sacramento Valley | Shasta | Prime Generators | 50 | 0.1 | 0.0001 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 120 | 0.6 | 0.0005 | 0.0013 | 0.0001 | 0.0002 |
| | | | | 175 | 0.4 | 0.0005 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 250 | 0.4 | 0.0006 | 0.0018 | 0.0001 | 0.0002 |
| | | | | 500 | 0.9 | 0.0021 | 0.0065 | 0.0004 | 0.0005 |
| | | | | 750 | 0.1 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.2 | 0.0014 | 0.0040 | 0.0002 | 0.0004 |
| | | | | 1500 | 0.2 | 0.0019 | 0.0055 | 0.0003 | 0.0005 |
| | | | | 2000 | 0.1 | 0.0012 | 0.0033 | 0.0002 | 0.0003 |
| | | | | 3000 | 0.1 | 0.0027 | 0.0076 | 0.0004 | 0.0007 |
| | | | | 10000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.4 | 0.0003 | 0.0008 | 0.0001 | 0.0001 |
| | | | | 175 | 0.2 | 0.0003 | 0.0008 | 0.0001 | 0.0001 |
| | | | | 250 | 0.2 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 500 | 0.6 | 0.0014 | 0.0043 | 0.0002 | 0.0004 |
| | | | | 750 | 0.1 | 0.0003 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0009 | 0.0026 | 0.0001 | 0.0002 |
| | | | | 1500 | 0.1 | 0.0013 | 0.0036 | 0.0002 | 0.0003 |
| | | | | 2000 | 0.1 | 0.0008 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0018 | 0.0050 | 0.0003 | 0.0004 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 1.7 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 11.3 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 175 | 7.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 250 | 6.8 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 500 | 16.8 | 0.0012 | 0.0038 | 0.0002 | 0.0003 |
| | | | | 750 | 2.2 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 1000 | 3.8 | 0.0008 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 1500 | 3.8 | 0.0011 | 0.0031 | 0.0002 | 0.0003 |
| | | | | 2000 | 1.6 | 0.0006 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 3000 | 2.6 | 0.0015 | 0.0044 | 0.0002 | 0.0004 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 1.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 7.3 | 0.0002 | 0.0004 | 0.0000 | 0.0001 |
| | | | | 175 | 4.6 | 0.0002 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 250 | 4.4 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 500 | 10.9 | 0.0008 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 750 | 1.5 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1000 | 2.4 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 1500 | 2.5 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 2000 | 1.1 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 3000 | 1.7 | 0.0010 | 0.0028 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| Shasta County AQMD Total | 0 | 0 | 0 | | 100.3 | 0.0294 | 0.0861 | 0.0045 | 0.0076 |
| Siskiyou County APCD | Northeast Plateau | Siskiyou | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 500 | 0.2 | 0.0005 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.1 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 1500 | 0.1 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 500 | 0.1 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 1500 | 0.0 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0005 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | Backup Generators | 50 | 0.5 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 2.9 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 1.8 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 1.8 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 500 | 4.3 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 750 | 0.6 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.0 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 1500 | 1.0 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.4 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.7 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 1.9 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 1.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 1.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 2.8 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 750 | 0.4 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.6 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.6 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.3 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.4 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Siskiyou County APCD Total | 0 | 0 | 0 | | 26.0 | 0.0076 | 0.0223 | 0.0012 | 0.0020 |
| South Coast AQMD | Mojave Desert | Riverside | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0001 | 0.0000 | [illegible] |
| | | | | 250 | 0.0 | 0.0000 | 0.0001 | 0.0000 | [illegible] |
| | | | | 500 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 1000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.7 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.4 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 500 | 1.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 750 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.2 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.2 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.6 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 750 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.1 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | Salton Sea | | Prime Generators | 50 | 0.2 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 1.2 | 0.0010 | 0.0026 | 0.0003 | 0.0003 |
| | | | | 175 | 0.8 | 0.0010 | 0.0026 | 0.0002 | 0.0003 |
| | | | | 250 | 0.7 | 0.0012 | 0.0037 | 0.0002 | 0.0003 |
| | | | | 500 | 1.8 | 0.0042 | 0.0133 | 0.0007 | 0.0011 |
| | | | | 750 | 0.2 | 0.0009 | 0.0029 | 0.0002 | 0.0002 |
| | | | | 1000 | 0.4 | 0.0029 | 0.0081 | 0.0004 | 0.0007 |
| | | | | 1500 | 0.4 | 0.0040 | 0.0113 | 0.0006 | 0.0010 |
| | | | | 2000 | 0.2 | 0.0024 | 0.0068 | 0.0003 | 0.0006 |
| | | | | 3000 | 0.3 | 0.0055 | 0.0157 | 0.0008 | 0.0014 |
| | | | | 10000 | 0.0 | 0.0004 | 0.0010 | 0.0001 | 0.0001 |
| | | | Prime Pumps | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.8 | 0.0007 | 0.0017 | 0.0002 | 0.0002 |
| | | | | 175 | 0.5 | 0.0006 | 0.0017 | 0.0001 | 0.0002 |
| | | | | 250 | 0.5 | 0.0007 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 500 | 1.2 | 0.0028 | 0.0089 | 0.0005 | 0.0007 |
| | | | | 750 | 0.2 | 0.0006 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 1000 | 0.3 | 0.0019 | 0.0053 | 0.0003 | 0.0005 |
| | | | | 1500 | 0.3 | 0.0026 | 0.0074 | 0.0004 | 0.0007 |
| | | | | 2000 | 0.1 | 0.0016 | 0.0045 | 0.0002 | 0.0004 |
| | | | | 3000 | 0.2 | 0.0036 | 0.0102 | 0.0005 | 0.0009 |
| | | | | 10000 | 0.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0003 | 0.0006 | 0.0001 | 0.0001 |
| | | | | 120 | 0.0 | 0.0003 | 0.0006 | 0.0001 | [illegible] |
| | | | | 120 | 0.1 | 0.0003 | 0.0006 | 0.0001 | [illegible] |
| | | | | 120 | 0.5 | 0.0003 | 0.0006 | 0.0001 | [illegible] |
| | | | | 175 | 0.0 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 175 | 0.1 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 175 | 0.2 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 250 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 250 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 250 | 0.1 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 250 | 0.4 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 500 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 500 | 0.1 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 500 | 0.1 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 500 | 0.2 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 750 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 3.6 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 23.1 | 0.0005 | 0.0014 | 0.0001 | 0.0002 |
| | | | | 175 | 14.4 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 250 | 13.9 | 0.0006 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 500 | 34.4 | 0.0024 | 0.0077 | 0.0003 | 0.0006 |
| | | | | 750 | 4.6 | 0.0005 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 1000 | 7.7 | 0.0016 | 0.0046 | 0.0002 | 0.0004 |
| | | | | 1500 | 7.7 | 0.0022 | 0.0064 | 0.0003 | 0.0005 |
| | | | | 2000 | 3.4 | 0.0013 | 0.0039 | 0.0002 | 0.0003 |
| | | | | 3000 | 5.4 | 0.0030 | 0.0089 | 0.0004 | [illegible] |
| | | | | 10000 | 0.2 | 0.0002 | 0.0006 | 0.0000 | [illegible] |
| | | | Backup Pumps | 50 | 2.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 15.0 | 0.0003 | 0.0009 | 0.0001 | 0.0001 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 175 | 9.4 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 250 | 9.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 500 | 22.4 | 0.0016 | 0.0051 | 0.0002 | 0.0004 |
| | | | | 750 | 3.0 | 0.0003 | 0.0011 | 0.0000 | 0.0001 |
| | | | | 1000 | 5.0 | 0.0010 | 0.0030 | 0.0001 | 0.0002 |
| | | | | 1500 | 5.0 | 0.0014 | 0.0042 | 0.0002 | 0.0003 |
| | | | | 2000 | 2.2 | 0.0009 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 3000 | 3.5 | 0.0020 | 0.0058 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | South Coast | Los Angeles | Prime Generators | 50 | 5.1 | 0.0032 | 0.0027 | 0.0004 | 0.0013 |
| | | | | 120 | 33.2 | 0.0285 | 0.0706 | 0.0070 | 0.0094 |
| | | | | 175 | 20.7 | 0.0264 | 0.0715 | 0.0047 | 0.0070 |
| | | | | 250 | 20.0 | 0.0327 | 0.1001 | 0.0059 | 0.0090 |
| | | | | 500 | 49.5 | 0.1155 | 0.3638 | 0.0197 | 0.0305 |
| | | | | 750 | 6.6 | 0.0253 | 0.0795 | 0.0043 | 0.0067 |
| | | | | 1000 | 11.1 | 0.0779 | 0.2214 | 0.0111 | 0.0199 |
| | | | | 1500 | 11.1 | 0.1086 | 0.3088 | 0.0155 | 0.0277 |
| | | | | 2000 | 4.8 | 0.0658 | 0.1871 | 0.0094 | 0.0168 |
| | | | | 3000 | 7.8 | 0.1508 | 0.4286 | 0.0216 | 0.0385 |
| | | | | 10000 | 0.3 | 0.0101 | 0.0286 | 0.0014 | 0.0026 |
| | | | Prime Pumps | 50 | 3.3 | 0.0023 | 0.0020 | 0.0003 | 0.0009 |
| | | | | 120 | 21.6 | 0.0186 | 0.0460 | 0.0046 | 0.0061 |
| | | | | 175 | 13.5 | 0.0170 | 0.0459 | 0.0030 | 0.0045 |
| | | | | 250 | 13.0 | 0.0202 | 0.0617 | 0.0036 | 0.0055 |
| | | | | 500 | 32.2 | 0.0770 | 0.2426 | 0.0131 | 0.0203 |
| | | | | 750 | 4.3 | 0.0165 | 0.0517 | 0.0028 | 0.0044 |
| | | | | 1000 | 7.2 | 0.0507 | 0.1441 | 0.0072 | 0.0129 |
| | | | | 1500 | 7.2 | 0.0707 | 0.2010 | 0.0101 | 0.0180 |
| | | | | 2000 | 3.1 | 0.0428 | 0.1217 | 0.0061 | 0.0109 |
| | | | | 3000 | 5.1 | 0.0981 | 0.2789 | 0.0140 | 0.0250 |
| | | | | 10000 | 0.2 | 0.0066 | 0.0186 | 0.0009 | 0.0017 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0069 | 0.0172 | 0.0016 | 0.0022 |
| | | | | 120 | 0.6 | 0.0069 | 0.0172 | 0.0016 | 0.0022 |
| | | | | 120 | 2.5 | 0.0069 | 0.0172 | 0.0016 | 0.0022 |
| | | | | 120 | 13.5 | 0.0069 | 0.0172 | 0.0016 | 0.0022 |
| | | | | 175 | 0.0 | 0.0059 | 0.0159 | 0.0010 | 0.0016 |
| | | | | 175 | 3.7 | 0.0059 | 0.0159 | 0.0010 | 0.0016 |
| | | | | 175 | 6.8 | 0.0059 | 0.0159 | 0.0010 | 0.0016 |
| | | | | 250 | 0.0 | 0.0101 | 0.0308 | 0.0018 | 0.0028 |
| | | | | 250 | 1.2 | 0.0101 | 0.0308 | 0.0018 | 0.0028 |
| | | | | 250 | 1.8 | 0.0101 | 0.0308 | 0.0018 | 0.0028 |
| | | | | 250 | 11.7 | 0.0101 | 0.0308 | 0.0018 | 0.0028 |
| | | | | 500 | 0.0 | 0.0100 | 0.0314 | 0.0017 | 0.0026 |
| | | | | 500 | 1.8 | 0.0100 | 0.0314 | 0.0017 | 0.0026 |
| | | | | 500 | 3.1 | 0.0100 | 0.0314 | 0.0017 | 0.0026 |
| | | | | 500 | 4.3 | 0.0100 | 0.0314 | 0.0017 | 0.0026 |
| | | | | 750 | 0.0 | 0.0031 | 0.0098 | 0.0005 | 0.0008 |
| | | | | 750 | 1.8 | 0.0031 | 0.0098 | 0.0005 | 0.0008 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 97.5 | 0.0011 | 0.0015 | 0.0002 | 0.0004 |
| | | | | 120 | 631.5 | 0.0147 | 0.0376 | 0.0028 | 0.0043 |
| | | | | 175 | 393.9 | 0.0139 | 0.0393 | 0.0020 | 0.0034 |
| | | | | 250 | 379.7 | 0.0176 | 0.0553 | 0.0026 | 0.0045 |
| | | | | 500 | 940.5 | 0.0650 | 0.2107 | 0.0094 | 0.0162 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day, | | | |
| | | | | 750 | 125.0 | 0.0142 | 0.0459 | 0.0021 | 0.0036 |
| | | | | 1000 | 211.0 | 0.0425 | 0.1262 | 0.0060 | 0.0103 |
| | | | | 1500 | 211.3 | 0.0593 | 0.1760 | 0.0084 | 0.0144 |
| | | | | 2000 | 91.8 | 0.0359 | 0.1066 | 0.0051 | 0.0087 |
| | | | | 3000 | 148.5 | 0.0823 | 0.2443 | 0.0117 | 0.0199 |
| | | | | 10000 | 5.1 | 0.0055 | 0.0163 | 0.0008 | 0.0013 |
| | | | Backup Pumps | 50 | 63.4 | 0.0008 | 0.0011 | 0.0001 | 0.0003 |
| | | | | 120 | 410.9 | 0.0096 | 0.0244 | 0.0018 | 0.0028 |
| | | | | 175 | 256.3 | 0.0089 | 0.0252 | 0.0013 | 0.0022 |
| | | | | 250 | 247.1 | 0.0109 | 0.0341 | 0.0016 | 0.0028 |
| | | | | 500 | 612.1 | 0.0433 | 0.1405 | 0.0063 | 0.0108 |
| | | | | 750 | 81.3 | 0.0093 | 0.0299 | 0.0013 | 0.0023 |
| | | | | 1000 | 137.3 | 0.0277 | 0.0821 | 0.0039 | 0.0067 |
| | | | | 1500 | 137.5 | 0.0386 | 0.1145 | 0.0055 | 0.0093 |
| | | | | 2000 | 59.7 | 0.0234 | 0.0694 | 0.0033 | 0.0057 |
| | | | | 3000 | 96.7 | 0.0536 | 0.1590 | 0.0076 | 0.0130 |
| | | | | 10000 | 3.3 | 0.0036 | 0.0106 | 0.0005 | 0.0009 |
| | | Orange | Prime Generators | 50 | 1.6 | 0.0010 | 0.0008 | 0.0001 | 0.0004 |
| | | | | 120 | 10.2 | 0.0088 | 0.0218 | 0.0022 | 0.0029 |
| | | | | 175 | 6.4 | 0.0081 | 0.0220 | 0.0014 | 0.0022 |
| | | | | 250 | 6.2 | 0.0101 | 0.0308 | 0.0018 | 0.0028 |
| | | | | 500 | 15.2 | 0.0356 | 0.1121 | 0.0061 | 0.0094 |
| | | | | 750 | 2.0 | 0.0078 | 0.0245 | 0.0013 | 0.0021 |
| | | | | 1000 | 3.4 | 0.0240 | 0.0682 | 0.0034 | 0.0061 |
| | | | | 1500 | 3.4 | 0.0335 | 0.0951 | 0.0048 | 0.0085 |
| | | | | 2000 | 1.5 | 0.0203 | 0.0576 | 0.0029 | 0.00[illegible] |
| | | | | 3000 | 2.4 | 0.0464 | 0.1320 | 0.0066 | 0.0[illegible] |
| | | | | 10000 | 0.1 | 0.0031 | 0.0088 | 0.0004 | 0.00[illegible] |
| | | | Prime Pumps | 50 | 1.0 | 0.0007 | 0.0006 | 0.0001 | 0.0003 |
| | | | | 120 | 6.7 | 0.0057 | 0.0142 | 0.0014 | 0.0019 |
| | | | | 175 | 4.2 | 0.0052 | 0.0141 | 0.0009 | 0.0014 |
| | | | | 250 | 4.0 | 0.0062 | 0.0190 | 0.0011 | 0.0017 |
| | | | | 500 | 9.9 | 0.0237 | 0.0747 | 0.0040 | 0.0063 |
| | | | | 750 | 1.3 | 0.0051 | 0.0159 | 0.0009 | 0.0014 |
| | | | | 1000 | 2.2 | 0.0156 | 0.0444 | 0.0022 | 0.0040 |
| | | | | 1500 | 2.2 | 0.0218 | 0.0619 | 0.0031 | 0.0056 |
| | | | | 2000 | 1.0 | 0.0132 | 0.0375 | 0.0019 | 0.0034 |
| | | | | 3000 | 1.6 | 0.0302 | 0.0859 | 0.0043 | 0.0077 |
| | | | | 10000 | 0.1 | 0.0020 | 0.0057 | 0.0003 | 0.0005 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0021 | 0.0053 | 0.0005 | 0.0007 |
| | | | | 120 | 0.2 | 0.0021 | 0.0053 | 0.0005 | 0.0007 |
| | | | | 120 | 0.8 | 0.0021 | 0.0053 | 0.0005 | 0.0007 |
| | | | | 120 | 4.2 | 0.0021 | 0.0053 | 0.0005 | 0.0007 |
| | | | | 175 | 0.0 | 0.0018 | 0.0049 | 0.0003 | 0.0005 |
| | | | | 175 | 1.1 | 0.0018 | 0.0049 | 0.0003 | 0.0005 |
| | | | | 175 | 2.1 | 0.0018 | 0.0049 | 0.0003 | 0.0005 |
| | | | | 250 | 0.0 | 0.0031 | 0.0095 | 0.0006 | 0.0009 |
| | | | | 250 | 0.4 | 0.0031 | 0.0095 | 0.0006 | 0.0009 |
| | | | | 250 | 0.6 | 0.0031 | 0.0095 | 0.0006 | 0.0009 |
| | | | | 250 | 3.6 | 0.0031 | 0.0095 | 0.0006 | 0.0009 |
| | | | | 500 | 0.0 | 0.0031 | 0.0097 | 0.0005 | 0.0008 |
| | | | | 500 | 0.6 | 0.0031 | 0.0097 | 0.0005 | 0.0008 |
| | | | | 500 | 0.9 | 0.0031 | 0.0097 | 0.0005 | 0.0008 |
| | | | | 500 | 1.3 | 0.0031 | 0.0097 | 0.0005 | 0.0008 |
| | | | | 750 | 0.0 | 0.0010 | 0.0030 | 0.0002 | 0.0003 |
| | | | | 750 | 0.6 | 0.0010 | 0.0030 | 0.0002 | 0.0[illegible] |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0[illegible] |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 30.0 | 0.0003 | 0.0005 | 0.0001 | 0.0001 |
| | | | | 120 | 194.5 | 0.0045 | 0.0116 | 0.0009 | 0.0013 |
| | | | | 175 | 121.3 | 0.0043 | 0.0121 | 0.0006 | 0.0011 |
| | | | | 250 | 117.0 | 0.0054 | 0.0170 | 0.0008 | 0.0014 |
| | | | | 500 | 289.7 | 0.0200 | 0.0649 | 0.0029 | 0.0050 |
| | | | | 750 | 38.5 | 0.0044 | 0.0141 | 0.0006 | 0.0011 |
| | | | | 1000 | 65.0 | 0.0131 | 0.0389 | 0.0019 | 0.0032 |
| | | | | 1500 | 65.1 | 0.0183 | 0.0542 | 0.0026 | 0.0044 |
| | | | | 2000 | 28.3 | 0.0111 | 0.0328 | 0.0016 | 0.0027 |
| | | | | 3000 | 45.8 | 0.0254 | 0.0752 | 0.0036 | 0.0061 |
| | | | | 10000 | 1.6 | 0.0017 | 0.0050 | 0.0002 | 0.0004 |
| | | | Backup Pumps | 50 | 19.5 | 0.0002 | 0.0003 | 0.0000 | 0.0001 |
| | | | | 120 | 126.6 | 0.0029 | 0.0075 | 0.0006 | 0.0009 |
| | | | | 175 | 79.0 | 0.0027 | 0.0078 | 0.0004 | 0.0007 |
| | | | | 250 | 76.1 | 0.0033 | 0.0105 | 0.0005 | 0.0008 |
| | | | | 500 | 188.5 | 0.0134 | 0.0433 | 0.0019 | 0.0033 |
| | | | | 750 | 25.0 | 0.0028 | 0.0092 | 0.0004 | 0.0007 |
| | | | | 1000 | 42.3 | 0.0085 | 0.0253 | 0.0012 | 0.0021 |
| | | | | 1500 | 42.4 | 0.0119 | 0.0353 | 0.0017 | 0.0029 |
| | | | | 2000 | 18.4 | 0.0072 | 0.0214 | 0.0010 | 0.0017 |
| | | | | 3000 | 29.8 | 0.0165 | 0.0490 | 0.0023 | 0.0040 |
| | | | | 10000 | 1.0 | 0.0011 | 0.0033 | 0.0002 | 0.0003 |
| | | Riverside | Prime Generators | 50 | 0.7 | 0.0004 | 0.0004 | 0.0001 | 0.0002 |
| | | | | 120 | 4.5 | 0.0039 | 0.0096 | 0.0009 | 0.0013 |
| | | | | 175 | 2.8 | 0.0036 | 0.0097 | 0.0006 | 0.0010 |
| | | | | 250 | 2.7 | 0.0044 | 0.0135 | 0.0008 | 0.0012 |
| | | | | 500 | 6.7 | 0.0156 | 0.0492 | 0.0027 | 0.0041 |
| | | | | 750 | 0.9 | 0.0034 | 0.0108 | 0.0006 | 0.0009 |
| | | | | 1000 | 1.5 | 0.0105 | 0.0300 | 0.0015 | 0.0027 |
| | | | | 1500 | 1.5 | 0.0147 | 0.0418 | 0.0021 | 0.0038 |
| | | | | 2000 | 0.7 | 0.0089 | 0.0253 | 0.0013 | 0.0023 |
| | | | | 3000 | 1.1 | 0.0204 | 0.0580 | 0.0029 | 0.0052 |
| | | | | 10000 | 0.0 | 0.0014 | 0.0039 | 0.0002 | 0.0003 |
| | | | Prime Pumps | 50 | 0.5 | 0.0003 | 0.0003 | 0.0000 | 0.0001 |
| | | | | 120 | 2.9 | 0.0025 | 0.0062 | 0.0006 | 0.0008 |
| | | | | 175 | 1.8 | 0.0023 | 0.0062 | 0.0004 | 0.0006 |
| | | | | 250 | 1.8 | 0.0027 | 0.0084 | 0.0005 | 0.0007 |
| | | | | 500 | 4.4 | 0.0104 | 0.0328 | 0.0018 | 0.0028 |
| | | | | 750 | 0.6 | 0.0022 | 0.0070 | 0.0004 | 0.0006 |
| | | | | 1000 | 1.0 | 0.0069 | 0.0195 | 0.0010 | 0.0018 |
| | | | | 1500 | 1.0 | 0.0096 | 0.0272 | 0.0014 | 0.0024 |
| | | | | 2000 | 0.4 | 0.0058 | 0.0165 | 0.0008 | 0.0015 |
| | | | | 3000 | 0.7 | 0.0133 | 0.0377 | 0.0019 | 0.0034 |
| | | | | 10000 | 0.0 | 0.0009 | 0.0025 | 0.0001 | 0.0002 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0009 | 0.0023 | 0.0002 | 0.0003 |
| | | | | 120 | 0.1 | 0.0009 | 0.0023 | 0.0002 | 0.0003 |
| | | | | 120 | 0.3 | 0.0009 | 0.0023 | 0.0002 | 0.0003 |
| | | | | 120 | 1.8 | 0.0009 | 0.0023 | 0.0002 | 0.0003 |
| | | | | 175 | 0.0 | 0.0008 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 175 | 0.5 | 0.0008 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 175 | 0.9 | 0.0008 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 250 | 0.0 | 0.0014 | 0.0042 | 0.0002 | 0.0004 |
| | | | | 250 | 0.2 | 0.0014 | 0.0042 | 0.0002 | 0.0004 |
| | | | | 250 | 0.2 | 0.0014 | 0.0042 | 0.0002 | 0.0004 |
| | | | | 250 | 1.6 | 0.0014 | 0.0042 | 0.0002 | 0.0004 |
| | | | | 500 | 0.0 | 0.0013 | 0.0043 | 0.0002 | 0.0004 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

| Revised September 10, 2003, 2003 | | | | | | Emissions (tons/day | | | |
|---|---|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
| | | | | 500 | 0.2 | 0.0013 | 0.0043 | 0.0002 | 0.0004 |
| | | | | 500 | 0.4 | 0.0013 | 0.0043 | 0.0002 | 0.0004 |
| | | | | 500 | 0.6 | 0.0013 | 0.0043 | 0.0002 | 0.0004 |
| | | | | 750 | 0.0 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 750 | 0.2 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 13.2 | 0.0001 | 0.0002 | 0.0000 | 0.0001 |
| | | | | 120 | 85.5 | 0.0020 | 0.0051 | 0.0004 | 0.0006 |
| | | | | 175 | 53.3 | 0.0019 | 0.0053 | 0.0003 | 0.0005 |
| | | | | 250 | 51.4 | 0.0024 | 0.0075 | 0.0004 | 0.0006 |
| | | | | 500 | 127.3 | 0.0088 | 0.0285 | 0.0013 | 0.0022 |
| | | | | 750 | 16.9 | 0.0019 | 0.0062 | 0.0003 | 0.0005 |
| | | | | 1000 | 28.6 | 0.0058 | 0.0171 | 0.0008 | 0.0014 |
| | | | | 1500 | 28.6 | 0.0080 | 0.0238 | 0.0011 | 0.0019 |
| | | | | 2000 | 12.4 | 0.0049 | 0.0144 | 0.0007 | 0.0012 |
| | | | | 3000 | 20.1 | 0.0111 | 0.0331 | 0.0016 | 0.0027 |
| | | | | 10000 | 0.7 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | Backup Pumps | 50 | 8.6 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 55.6 | 0.0013 | 0.0033 | 0.0002 | 0.0004 |
| | | | | 175 | 34.7 | 0.0012 | 0.0034 | 0.0002 | 0.0003 |
| | | | | 250 | 33.4 | 0.0015 | 0.0046 | 0.0002 | 0.0004 |
| | | | | 500 | 82.8 | 0.0059 | 0.0190 | 0.0009 | [illegible] |
| | | | | 750 | 11.0 | 0.0013 | 0.0040 | 0.0002 | [illegible] |
| | | | | 1000 | 18.6 | 0.0037 | 0.0111 | 0.0005 | [illegible] |
| | | | | 1500 | 18.6 | 0.0052 | 0.0155 | 0.0007 | 0.0013 |
| | | | | 2000 | 8.1 | 0.0032 | 0.0094 | 0.0004 | 0.0008 |
| | | | | 3000 | 13.1 | 0.0072 | 0.0215 | 0.0010 | 0.0018 |
| | | | | 10000 | 0.5 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | San Bernardino | Prime Generators | 50 | 0.8 | 0.0005 | 0.0004 | 0.0001 | 0.0002 |
| | | | | 120 | 4.9 | 0.0042 | 0.0104 | 0.0010 | 0.0014 |
| | | | | 175 | 3.0 | 0.0039 | 0.0105 | 0.0007 | 0.0010 |
| | | | | 250 | 2.9 | 0.0048 | 0.0147 | 0.0009 | 0.0013 |
| | | | | 500 | 7.3 | 0.0170 | 0.0534 | 0.0029 | 0.0045 |
| | | | | 750 | 1.0 | 0.0037 | 0.0117 | 0.0006 | 0.0010 |
| | | | | 1000 | 1.6 | 0.0114 | 0.0325 | 0.0016 | 0.0029 |
| | | | | 1500 | 1.6 | 0.0160 | 0.0454 | 0.0023 | 0.0041 |
| | | | | 2000 | 0.7 | 0.0097 | 0.0275 | 0.0014 | 0.0025 |
| | | | | 3000 | 1.1 | 0.0222 | 0.0630 | 0.0032 | 0.0057 |
| | | | | 10000 | 0.0 | 0.0015 | 0.0042 | 0.0002 | 0.0004 |
| | | | Prime Pumps | 50 | 0.5 | 0.0003 | 0.0003 | 0.0000 | 0.0001 |
| | | | | 120 | 3.2 | 0.0027 | 0.0068 | 0.0007 | 0.0009 |
| | | | | 175 | 2.0 | 0.0025 | 0.0067 | 0.0004 | 0.0007 |
| | | | | 250 | 1.9 | 0.0030 | 0.0091 | 0.0005 | 0.0008 |
| | | | | 500 | 4.7 | 0.0113 | 0.0356 | 0.0019 | 0.0030 |
| | | | | 750 | 0.6 | 0.0024 | 0.0076 | 0.0004 | 0.0006 |
| | | | | 1000 | 1.1 | 0.0074 | 0.0212 | 0.0011 | 0.0019 |
| | | | | 1500 | 1.1 | 0.0104 | 0.0295 | 0.0015 | 0.0026 |
| | | | | 2000 | 0.5 | 0.0063 | 0.0179 | 0.0009 | 0.0016 |
| | | | | 3000 | 0.7 | 0.0144 | 0.0410 | 0.0021 | 0.0037 |
| | | | | 10000 | 0.0 | 0.0010 | 0.0027 | 0.0001 | 0.0002 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0010 | 0.0025 | 0.0002 | [illegible] |
| | | | | 120 | 0.1 | 0.0010 | 0.0025 | 0.0002 | [illegible] |
| | | | | 120 | 0.4 | 0.0010 | 0.0025 | 0.0002 | 0.0003 |
| | | | | 120 | 2.0 | 0.0010 | 0.0025 | 0.0002 | 0.0003 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 175 | 0.0 | 0.0009 | 0.0023 | 0.0002 | 0.0002 |
| | | | | 175 | 0.5 | 0.0009 | 0.0023 | 0.0002 | 0.0002 |
| | | | | 175 | 1.0 | 0.0009 | 0.0023 | 0.0002 | 0.0002 |
| | | | | 250 | 0.0 | 0.0015 | 0.0045 | 0.0003 | 0.0004 |
| | | | | 250 | 0.2 | 0.0015 | 0.0045 | 0.0003 | 0.0004 |
| | | | | 250 | 0.3 | 0.0015 | 0.0045 | 0.0003 | 0.0004 |
| | | | | 250 | 1.7 | 0.0015 | 0.0045 | 0.0003 | 0.0004 |
| | | | | 500 | 0.0 | 0.0015 | 0.0046 | 0.0002 | 0.0004 |
| | | | | 500 | 0.3 | 0.0015 | 0.0046 | 0.0002 | 0.0004 |
| | | | | 500 | 0.5 | 0.0015 | 0.0046 | 0.0002 | 0.0004 |
| | | | | 500 | 0.6 | 0.0015 | 0.0046 | 0.0002 | 0.0004 |
| | | | | 750 | 0.0 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 750 | 0.3 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 14.3 | 0.0002 | 0.0002 | 0.0000 | 0.0001 |
| | | | | 120 | 92.8 | 0.0022 | 0.0055 | 0.0004 | 0.0006 |
| | | | | 175 | 57.9 | 0.0020 | 0.0058 | 0.0003 | 0.0005 |
| | | | | 250 | 55.8 | 0.0026 | 0.0081 | 0.0004 | 0.0007 |
| | | | | 500 | 138.2 | 0.0095 | 0.0310 | 0.0014 | 0.0024 |
| | | | | 750 | 18.4 | 0.0021 | 0.0067 | 0.0003 | 0.0005 |
| | | | | 1000 | 31.0 | 0.0062 | 0.0185 | 0.0009 | 0.0015 |
| | | | | 1500 | 31.0 | 0.0087 | 0.0259 | 0.0012 | 0.0021 |
| | | | | 2000 | 13.5 | 0.0053 | 0.0157 | 0.0008 | 0.0013 |
| | | | | 3000 | 21.8 | 0.0121 | 0.0359 | 0.0017 | 0.0029 |
| | | | | 10000 | 0.8 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | Backup Pumps | 50 | 9.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 120 | 60.4 | 0.0014 | 0.0036 | 0.0003 | 0.0004 |
| | | | | 175 | 37.7 | 0.0013 | 0.0037 | 0.0002 | 0.0003 |
| | | | | 250 | 36.3 | 0.0016 | 0.0050 | 0.0002 | 0.0004 |
| | | | | 500 | 89.9 | 0.0064 | 0.0206 | 0.0009 | 0.0016 |
| | | | | 750 | 11.9 | 0.0014 | 0.0044 | 0.0002 | 0.0003 |
| | | | | 1000 | 20.2 | 0.0041 | 0.0121 | 0.0006 | 0.0010 |
| | | | | 1500 | 20.2 | 0.0057 | 0.0168 | 0.0008 | 0.0014 |
| | | | | 2000 | 8.8 | 0.0034 | 0.0102 | 0.0005 | 0.0008 |
| | | | | 3000 | 14.2 | 0.0079 | 0.0234 | 0.0011 | 0.0019 |
| | | | | 10000 | 0.5 | 0.0005 | 0.0016 | 0.0001 | 0.0001 |
| South Coast AQMD Total | 0 | 0 | 0 | | 9239.3 | 2.8953 | 8.4854 | 0.4495 | 0.7494 |
| Tehama County APCD | Sacramento Valley | Tehama | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.2 | 0.0002 | 0.0004 | 0.0000 | 0.0001 |
| | | | | 175 | 0.1 | 0.0002 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 500 | 0.3 | 0.0007 | 0.0022 | 0.0001 | 0.0002 |
| | | | | 750 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.1 | 0.0005 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 1500 | 0.1 | 0.0006 | 0.0018 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0009 | 0.0026 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 500 | 0.2 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day, CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 1500 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0006 | 0.0017 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.6 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 3.8 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 2.4 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 2.3 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 500 | 5.6 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 750 | 0.7 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.3 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 1500 | 1.3 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.5 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.9 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | [illegible] |
| | | | Backup Pumps | 50 | 0.4 | 0.0000 | 0.0000 | 0.0000 | [illegible] |
| | | | | 120 | 2.5 | 0.0001 | 0.0001 | 0.0000 | [illegible] |
| | | | | 175 | 1.5 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 1.5 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 3.7 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 750 | 0.5 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.8 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.8 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.4 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.6 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| Tehama County APCD Total | 0 | 0 | 0 | | 33.6 | 0.0098 | 0.0288 | 0.0015 | 0.0025 |
| Tuolumne County APCD | Mountain Counties | Tuolumne | Prime Generators | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.2 | 0.0002 | 0.0004 | 0.0000 | 0.0001 |
| | | | | 175 | 0.1 | 0.0002 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 500 | 0.3 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 750 | 0.0 | 0.0001 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.1 | 0.0005 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 1500 | 0.1 | 0.0006 | 0.0018 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.0 | 0.0009 | 0.0025 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 0.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 500 | 0.2 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 750 | 0.0 | 0.0001 | 0.0003 | 0.0000 | [illegible] |
| | | | | 1000 | 0.0 | 0.0003 | 0.0008 | 0.0000 | [illegible] |
| | | | | 1500 | 0.0 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.0 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Emissions (tons/day) | | | |
| | | | | 3000 | 0.0 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 0.6 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 3.7 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 175 | 2.3 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 250 | 2.2 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 500 | 5.5 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 750 | 0.7 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.2 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 1500 | 1.2 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.5 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 3000 | 0.9 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 2.4 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 175 | 1.5 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 250 | 1.4 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 500 | 3.6 | 0.0003 | 0.0008 | 0.0000 | 0.0001 |
| | | | | 750 | 0.5 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.8 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.8 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 2000 | 0.4 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.6 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| Tuolumne County APCD Total | 0 | 0 | 0 | | 32.9 | 0.0097 | 0.0283 | 0.0015 | 0.0025 |
| Ventura County APCD | South Central Coast | Ventura | Prime Generators | 50 | 0.4 | 0.0003 | 0.0002 | 0.0000 | 0.0001 |
| | | | | 120 | 2.7 | 0.0023 | 0.0058 | 0.0006 | 0.0008 |
| | | | | 175 | 1.7 | 0.0022 | 0.0059 | 0.0004 | 0.0006 |
| | | | | 250 | 1.6 | 0.0027 | 0.0082 | 0.0005 | 0.0007 |
| | | | | 500 | 4.1 | 0.0095 | 0.0298 | 0.0016 | 0.0025 |
| | | | | 750 | 0.5 | 0.0021 | 0.0065 | 0.0004 | 0.0006 |
| | | | | 1000 | 0.9 | 0.0064 | 0.0181 | 0.0009 | 0.0016 |
| | | | | 1500 | 0.9 | 0.0089 | 0.0253 | 0.0013 | 0.0023 |
| | | | | 2000 | 0.4 | 0.0054 | 0.0153 | 0.0008 | 0.0014 |
| | | | | 3000 | 0.6 | 0.0124 | 0.0351 | 0.0018 | 0.0032 |
| | | | | 10000 | 0.0 | 0.0008 | 0.0023 | 0.0001 | 0.0002 |
| | | | Prime Pumps | 50 | 0.3 | 0.0002 | 0.0002 | 0.0000 | 0.0001 |
| | | | | 120 | 1.8 | 0.0015 | 0.0038 | 0.0004 | 0.0005 |
| | | | | 175 | 1.1 | 0.0014 | 0.0038 | 0.0002 | 0.0004 |
| | | | | 250 | 1.1 | 0.0017 | 0.0051 | 0.0003 | 0.0005 |
| | | | | 500 | 2.6 | 0.0063 | 0.0199 | 0.0011 | 0.0017 |
| | | | | 750 | 0.4 | 0.0013 | 0.0042 | 0.0002 | 0.0004 |
| | | | | 1000 | 0.6 | 0.0042 | 0.0118 | 0.0006 | 0.0011 |
| | | | | 1500 | 0.6 | 0.0058 | 0.0165 | 0.0008 | 0.0015 |
| | | | | 2000 | 0.3 | 0.0035 | 0.0100 | 0.0005 | 0.0009 |
| | | | | 3000 | 0.4 | 0.0080 | 0.0228 | 0.0011 | 0.0021 |
| | | | | 10000 | 0.0 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |

# Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0052 | 0.0128 | 0.0013 | 0.0017 |
| | | | | 120 | 5.0 | 0.0052 | 0.0128 | 0.0013 | 0.0017 |
| | | | | 120 | 6.0 | 0.0052 | 0.0128 | 0.0013 | 0.0017 |
| | | | | 175 | 0.0 | 0.0015 | 0.0041 | 0.0003 | 0.0004 |
| | | | | 175 | 1.0 | 0.0015 | 0.0041 | 0.0003 | 0.0004 |
| | | | | 250 | 0.0 | 0.0014 | 0.0041 | 0.0002 | 0.0004 |
| | | | | 250 | 2.0 | 0.0014 | 0.0041 | 0.0002 | 0.0004 |
| | | | | 500 | 0.0 | 0.0073 | 0.0230 | 0.0013 | 0.0020 |
| | | | | 500 | 1.0 | 0.0073 | 0.0230 | 0.0013 | 0.0020 |
| | | | | 500 | 5.0 | 0.0073 | 0.0230 | 0.0013 | 0.0020 |
| | | | | 750 | 0.0 | 0.0017 | 0.0053 | 0.0003 | 0.0005 |
| | | | | 750 | 1.0 | 0.0017 | 0.0053 | 0.0003 | 0.0005 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 8.0 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 51.7 | 0.0012 | 0.0031 | 0.0002 | 0.0004 |
| | | | | 175 | 32.3 | 0.0011 | 0.0032 | 0.0002 | 0.0003 |
| | | | | 250 | 31.1 | 0.0014 | 0.0045 | 0.0002 | 0.0004 |
| | | | | 500 | 77.0 | 0.0053 | 0.0173 | 0.0008 | 0.0013 |
| | | | | 750 | 10.2 | 0.0012 | 0.0038 | 0.0002 | 0.0003 |
| | | | | 1000 | 17.3 | 0.0035 | 0.0103 | 0.0005 | 0.0008 |
| | | | | 1500 | 17.3 | 0.0049 | 0.0144 | 0.0007 | 0.00[illegible] |
| | | | | 2000 | 7.5 | 0.0029 | 0.0087 | 0.0004 | 0.0[illegible] |
| | | | | 3000 | 12.2 | 0.0067 | 0.0200 | 0.0010 | 0.00[illegible] |
| | | | | 10000 | 0.4 | 0.0005 | 0.0013 | 0.0001 | 0.0001 |
| | | | Backup Pumps | 50 | 5.2 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 33.7 | 0.0008 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 175 | 21.0 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 250 | 20.2 | 0.0009 | 0.0028 | 0.0001 | 0.0002 |
| | | | | 500 | 50.1 | 0.0036 | 0.0115 | 0.0005 | 0.0009 |
| | | | | 750 | 6.7 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 1000 | 11.2 | 0.0023 | 0.0067 | 0.0003 | 0.0005 |
| | | | | 1500 | 11.3 | 0.0032 | 0.0094 | 0.0004 | 0.0008 |
| | | | | 2000 | 4.9 | 0.0019 | 0.0057 | 0.0003 | 0.0005 |
| | | | | 3000 | 7.9 | 0.0044 | 0.0130 | 0.0006 | 0.0011 |
| | | | | 10000 | 0.3 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| Ventura County APCD Total | 0 | 0 | 0 | | 481.6 | 0.1815 | 0.5298 | 0.0298 | 0.0481 |
| Yolo/Solano AQMD | Sacramento Valley | Solano | Prime Generators | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.4 | 0.0004 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 175 | 0.3 | 0.0003 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 250 | 0.3 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 500 | 0.6 | 0.0015 | 0.0048 | 0.0003 | 0.0004 |
| | | | | 750 | 0.1 | 0.0003 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0010 | 0.0029 | 0.0001 | 0.0003 |
| | | | | 1500 | 0.1 | 0.0014 | 0.0040 | 0.0002 | 0.0004 |
| | | | | 2000 | 0.1 | 0.0009 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0020 | 0.0056 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.3 | 0.0002 | 0.0006 | 0.0001 | 0.0001 |
| | | | | 175 | 0.2 | 0.0002 | 0.0006 | 0.0000 | 0.0001 |
| | | | | 250 | 0.2 | 0.0003 | 0.0008 | 0.0000 | 0.0[illegible] |
| | | | | 500 | 0.4 | 0.0010 | 0.0032 | 0.0002 | 0.0[illegible] |
| | | | | 750 | 0.1 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0007 | 0.0019 | 0.0001 | 0.0002 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

| District | Air Basin | County | Equipment | Horsepower Class | Population | Emissions (tons/day) CO | NOx | PM | ROG |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 1500 | 0.1 | 0.0009 | 0.0026 | 0.0001 | 0.0002 |
| | | | | 2000 | 0.0 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 3000 | 0.1 | 0.0013 | 0.0036 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 1.3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 8.3 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 175 | 5.1 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 250 | 5.0 | 0.0002 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 500 | 12.3 | 0.0008 | 0.0028 | 0.0001 | 0.0002 |
| | | | | 750 | 1.6 | 0.0002 | 0.0006 | 0.0000 | 0.0000 |
| | | | | 1000 | 2.8 | 0.0006 | 0.0016 | 0.0001 | 0.0001 |
| | | | | 1500 | 2.8 | 0.0008 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 2000 | 1.2 | 0.0005 | 0.0014 | 0.0001 | 0.0001 |
| | | | | 3000 | 1.9 | 0.0011 | 0.0032 | 0.0002 | 0.0003 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 0.8 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 5.4 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 175 | 3.4 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | | 250 | 3.2 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 500 | 8.0 | 0.0006 | 0.0018 | 0.0001 | 0.0001 |
| | | | | 750 | 1.1 | 0.0001 | 0.0004 | 0.0000 | 0.0000 |
| | | | | 1000 | 1.8 | 0.0004 | 0.0011 | 0.0001 | 0.0001 |
| | | | | 1500 | 1.8 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 2000 | 0.8 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 3000 | 1.3 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0001 | 0.0000 | 0.0000 |
| | | Yolo | Prime Generators | 50 | 0.1 | 0.0001 | 0.0001 | 0.0000 | 0.0000 |
| | | | | 120 | 0.6 | 0.0005 | 0.0013 | 0.0001 | 0.0002 |
| | | | | 175 | 0.4 | 0.0005 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 250 | 0.4 | 0.0006 | 0.0019 | 0.0001 | 0.0002 |
| | | | | 500 | 0.9 | 0.0022 | 0.0068 | 0.0004 | 0.0006 |
| | | | | 750 | 0.1 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.2 | 0.0015 | 0.0041 | 0.0002 | 0.0004 |
| | | | | 1500 | 0.2 | 0.0020 | 0.0058 | 0.0003 | 0.0005 |
| | | | | 2000 | 0.1 | 0.0012 | 0.0035 | 0.0002 | 0.0003 |
| | | | | 3000 | 0.1 | 0.0028 | 0.0080 | 0.0004 | 0.0007 |
| | | | | 10000 | 0.0 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | Prime Pumps | 50 | 0.1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.4 | 0.0003 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 175 | 0.3 | 0.0003 | 0.0009 | 0.0001 | 0.0001 |
| | | | | 250 | 0.2 | 0.0004 | 0.0012 | 0.0001 | 0.0001 |
| | | | | 500 | 0.6 | 0.0014 | 0.0045 | 0.0002 | 0.0004 |
| | | | | 750 | 0.1 | 0.0003 | 0.0010 | 0.0001 | 0.0001 |
| | | | | 1000 | 0.1 | 0.0009 | 0.0027 | 0.0001 | 0.0002 |
| | | | | 1500 | 0.1 | 0.0013 | 0.0038 | 0.0002 | 0.0003 |
| | | | | 2000 | 0.1 | 0.0008 | 0.0023 | 0.0001 | 0.0002 |
| | | | | 3000 | 0.1 | 0.0018 | 0.0052 | 0.0003 | 0.0005 |
| | | | | 10000 | 0.0 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |

## Attachment E

## District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

| Revised September 10, 2003, 2003 | | | | | | Emissions (tons/day | | | |
|---|---|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment | Horsepower Class | Population | CO | NOx | PM | ROG |
| | | | Other | 50 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 175 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 250 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 750 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 1500 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 2000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 3000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 10000 | 0.0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | Backup Generators | 50 | 1.8 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 11.8 | 0.0003 | 0.0007 | 0.0001 | 0.0001 |
| | | | | 175 | 7.4 | 0.0003 | 0.0007 | 0.0000 | 0.0001 |
| | | | | 250 | 7.1 | 0.0003 | 0.0010 | 0.0000 | 0.0001 |
| | | | | 500 | 17.6 | 0.0012 | 0.0039 | 0.0002 | 0.0003 |
| | | | | 750 | 2.3 | 0.0003 | 0.0009 | 0.0000 | 0.0001 |
| | | | | 1000 | 3.9 | 0.0008 | 0.0024 | 0.0001 | 0.0002 |
| | | | | 1500 | 3.9 | 0.0011 | 0.0033 | 0.0002 | 0.0003 |
| | | | | 2000 | 1.7 | 0.0007 | 0.0020 | 0.0001 | 0.0002 |
| | | | | 3000 | 2.8 | 0.0015 | 0.0046 | 0.0002 | 0.0004 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0003 | 0.0000 | 0.0000 |
| | | | Backup Pumps | 50 | 1.2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | 120 | 7.7 | 0.0002 | 0.0005 | 0.0000 | 0.0001 |
| | | | | 175 | 4.8 | 0.0002 | 0.0005 | 0.0000 | 0.0000 |
| | | | | 250 | 4.6 | 0.0002 | 0.0006 | 0.0000 | 0.0[illegible] |
| | | | | 500 | 11.4 | 0.0008 | 0.0026 | 0.0001 | 0.[illegible] |
| | | | | 750 | 1.5 | 0.0002 | 0.0006 | 0.0000 | 0.0[illegible] |
| | | | | 1000 | 2.6 | 0.0005 | 0.0015 | 0.0001 | 0.0001 |
| | | | | 1500 | 2.6 | 0.0007 | 0.0021 | 0.0001 | 0.0002 |
| | | | | 2000 | 1.1 | 0.0004 | 0.0013 | 0.0001 | 0.0001 |
| | | | | 3000 | 1.8 | 0.0010 | 0.0030 | 0.0001 | 0.0002 |
| | | | | 10000 | 0.1 | 0.0001 | 0.0002 | 0.0000 | 0.0000 |
| Yolo/Solano AQMD Total | 0 | 0 | 0 | | 178.4 | 0.0523 | 0.1532 | 0.0080 | 0.0134 |
| Grand Total | | | | | 20973.0 | 6.9056 | 20.2553 | 1.0702 | 1.7856 |

## Attachment F
## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| Amador County APCD | Mountain Counties | Amador | Air Compressors | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 1.0 | 0.1 | 1.1 |
| | | | | 120 | 6.6 | 2.8 | 9.4 |
| | | | | 175 | 0.3 | 1.0 | 1.3 |
| | | | | 250 | 0.4 | 2.0 | 2.4 |
| | | | | 500 | 0.3 | 2.8 | 3.1 |
| | | | | 750 | 0.0 | 0.1 | 0.1 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 5.4 | 0.0 | 5.4 |
| | | | | 25 | 3.9 | 0.0 | 3.9 |
| | | | | 50 | 4.8 | 0.5 | 5.3 |
| | | | | 120 | 7.4 | 3.2 | 10.6 |
| | | | | 175 | 0.3 | 1.2 | 1.5 |
| | | | | 250 | 0.3 | 1.9 | 2.3 |
| | | | | 500 | 0.5 | 4.1 | 4.5 |
| | | | | 750 | 0.1 | 1.0 | 1.1 |
| | | | | >750 | 0.1 | 1.0 | 1.1 |
| | | | Pressure Washers | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.1 | 0.0 | 0.1 |
| | | | | 120 | 0.0 | 0.0 | 0.1 |
| | | | Pumps | 15 | 4.0 | 0.0 | 4.0 |
| | | | | 25 | 1.2 | 0.0 | 1.2 |
| | | | | 50 | 2.1 | 0.2 | 2.3 |
| | | | | 120 | 4.1 | 1.8 | 5.9 |
| | | | | 175 | 0.5 | 1.9 | 2.4 |
| | | | | 250 | 0.2 | 1.0 | 1.2 |
| | | | | 500 | 0.4 | 3.3 | 3.6 |
| | | | | >750 | 0.0 | 0.2 | 0.2 |
| | | | Welders | 15 | 1.8 | 0.0 | 1.8 |
| | | | | 25 | 1.6 | 0.0 | 1.6 |
| | | | | 50 | 4.9 | 0.6 | 5.5 |
| | | | | 120 | 3.8 | 1.6 | 5.5 |
| | | | | 175 | 0.0 | 0.1 | 0.1 |
| Antelope Valley APCD | Mojave Desert | Los Angeles | Air Compressors | 15 | 0.5 | 0.0 | 0.5 |
| | | | | 25 | 1.0 | 0.0 | 1.0 |
| | | | | 50 | 8.4 | 0.9 | 9.4 |
| | | | | 120 | 56.5 | 24.2 | 80.7 |
| | | | | 175 | 2.2 | 8.9 | 11.1 |
| | | | | 250 | 3.0 | 17.3 | 20.3 |
| | | | | 500 | 2.7 | 24.2 | 26.9 |
| | | | | 750 | 0.1 | 1.0 | 1.1 |
| | | | | >750 | 0.0 | 0.3 | 0.3 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Generator Sets | 15 | 45.9 | 0.0 | 45.9 |
| | | | | 25 | 33.6 | 0.0 | 33.6 |
| | | | | 50 | 41.1 | 4.6 | 45.6 |
| | | | | 120 | 63.5 | 27.2 | 90.7 |
| | | | | 175 | 2.6 | 10.2 | 12.8 |
| | | | | 250 | 2.9 | 16.6 | 19.6 |
| | | | | 500 | 3.9 | 35.0 | 38.9 |
| | | | | 750 | 0.9 | 8.4 | 9.3 |
| | | | | >750 | 0.9 | 8.4 | 9.3 |
| | | | Pressure Washers | 15 | 2.1 | 0.0 | 2.1 |
| | | | | 25 | 0.5 | 0.0 | 0.5 |
| | | | | 50 | 1.0 | 0.1 | 1.1 |
| | | | | 120 | 0.4 | 0.1 | 0.5 |
| | | | Pumps | 15 | 34.5 | 0.0 | 34.5 |
| | | | | 25 | 10.3 | 0.0 | 10.3 |
| | | | | 50 | 18.0 | 2.0 | 19.9 |
| | | | | 120 | 35.2 | 15.1 | 50.4 |
| | | | | 175 | 4.0 | 16.2 | 20.2 |
| | | | | 250 | 1.6 | 8.8 | 10.4 |
| | | | | 500 | 3.1 | 28.0 | 31.[illegible] |
| | | | | >750 | 0.2 | 1.7 | 1.[illegible] |
| | | | Welders | 15 | 15.6 | 0.0 | 15.6 |
| | | | | 25 | 13.7 | 0.0 | 13.7 |
| | | | | 50 | 42.2 | 4.7 | 46.9 |
| | | | | 120 | 32.8 | 14.0 | 46.9 |
| | | | | 175 | 0.2 | 0.6 | 0.7 |
| Bay Area AQMD | San Francisco Bay Area | Alameda | Air Compressors | 15 | 2.2 | 0.0 | 2.2 |
| | | | | 25 | 4.6 | 0.0 | 4.6 |
| | | | | 50 | 40.5 | 4.4 | 44.9 |
| | | | | 120 | 270.7 | 116.0 | 386.7 |
| | | | | 175 | 10.6 | 42.4 | 53.0 |
| | | | | 250 | 14.6 | 82.7 | 97.3 |
| | | | | 500 | 12.9 | 115.8 | 128.7 |
| | | | | 750 | 0.5 | 4.7 | 5.3 |
| | | | | >750 | 0.2 | 1.4 | 1.5 |
| | | | Generator Sets | 15 | 220.1 | 0.0 | 220.1 |
| | | | | 25 | 161.0 | 0.0 | 161.0 |
| | | | | 50 | 196.8 | 21.9 | 218.8 |
| | | | | 120 | 304.4 | 130.3 | 434.7 |
| | | | | 175 | 12.3 | 49.1 | 61.4 |
| | | | | 250 | 14.0 | 79.7 | 93.7 |
| | | | | 500 | 18.7 | 167.8 | 186.4 |
| | | | | 750 | 4.4 | 40.1 | 44[illegible] |
| | | | | >750 | 4.4 | 40.1 | 44.[illegible] |

## Attachment F
## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Pressure Washers | 15 | 10.2 | 0.0 | 10.2 |
| | | | | 25 | 2.4 | 0.0 | 2.4 |
| | | | | 50 | 4.7 | 0.3 | 5.0 |
| | | | | 120 | 1.9 | 0.7 | 2.6 |
| | | | Pumps | 15 | 165.3 | 0.0 | 165.3 |
| | | | | 25 | 49.4 | 0.0 | 49.4 |
| | | | | 50 | 86.0 | 9.4 | 95.4 |
| | | | | 120 | 168.9 | 72.5 | 241.4 |
| | | | | 175 | 19.4 | 77.5 | 96.8 |
| | | | | 250 | 7.4 | 42.3 | 49.7 |
| | | | | 500 | 14.9 | 134.3 | 149.3 |
| | | | | >750 | 0.9 | 8.4 | 9.3 |
| | | | Welders | 15 | 74.7 | 0.0 | 74.7 |
| | | | | 25 | 65.8 | 0.0 | 65.8 |
| | | | | 50 | 202.4 | 22.6 | 225.0 |
| | | | | 120 | 157.2 | 67.3 | 224.5 |
| | | | | 175 | 0.8 | 2.8 | 3.6 |
| | | Contra Costa | Air Compressors | 15 | 1.5 | 0.0 | 1.5 |
| | | | | 25 | 3.1 | 0.0 | 3.1 |
| | | | | 50 | 26.8 | 2.9 | 29.7 |
| | | | | 120 | 179.3 | 76.8 | 256.1 |
| | | | | 175 | 7.0 | 28.1 | 35.1 |
| | | | | 250 | 9.7 | 54.8 | 64.4 |
| | | | | 500 | 8.5 | 76.7 | 85.2 |
| | | | | 750 | 0.4 | 3.1 | 3.5 |
| | | | | >750 | 0.1 | 0.9 | 1.0 |
| | | | Generator Sets | 15 | 145.8 | 0.0 | 145.8 |
| | | | | 25 | 106.6 | 0.0 | 106.6 |
| | | | | 50 | 130.4 | 14.5 | 144.9 |
| | | | | 120 | 201.6 | 86.3 | 288.0 |
| | | | | 175 | 8.1 | 32.5 | 40.7 |
| | | | | 250 | 9.3 | 52.8 | 62.1 |
| | | | | 500 | 12.4 | 111.1 | 123.5 |
| | | | | 750 | 2.9 | 26.6 | 29.5 |
| | | | | >750 | 2.9 | 26.6 | 29.5 |
| | | | Pressure Washers | 15 | 6.8 | 0.0 | 6.8 |
| | | | | 25 | 1.6 | 0.0 | 1.6 |
| | | | | 50 | 3.1 | 0.2 | 3.3 |
| | | | | 120 | 1.3 | 0.4 | 1.7 |
| | | | Pumps | 15 | 109.5 | 0.0 | 109.5 |
| | | | | 25 | 32.7 | 0.0 | 32.7 |
| | | | | 50 | 57.0 | 6.2 | 63.2 |
| | | | | 120 | 111.9 | 48.0 | 159.9 |
| | | | | 175 | 12.8 | 51.3 | 64.1 |
| | | | | 250 | 4.9 | 28.0 | 32.9 |

# Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 500 | 9.9 | 89.0 | 98.9 |
| | | | | >750 | 0.6 | 5.5 | 6.2 |
| | | | Welders | 15 | 49.5 | 0.0 | 49.5 |
| | | | | 25 | 43.6 | 0.0 | 43.6 |
| | | | | 50 | 134.1 | 15.0 | 149.0 |
| | | | | 120 | 104.1 | 44.6 | 148.7 |
| | | | | 175 | 0.5 | 1.9 | 2.4 |
| | | Marin | Air Compressors | 15 | 0.4 | 0.0 | 0.4 |
| | | | | 25 | 0.8 | 0.0 | 0.8 |
| | | | | 50 | 6.8 | 0.7 | 7.5 |
| | | | | 120 | 45.3 | 19.4 | 64.6 |
| | | | | 175 | 1.8 | 7.1 | 8.9 |
| | | | | 250 | 2.4 | 13.8 | 16.3 |
| | | | | 500 | 2.2 | 19.4 | 21.5 |
| | | | | 750 | 0.1 | 0.8 | 0.9 |
| | | | | >750 | 0.0 | 0.2 | 0.3 |
| | | | Generator Sets | 15 | 36.8 | 0.0 | 36.8 |
| | | | | 25 | 26.9 | 0.0 | 26.9 |
| | | | | 50 | 32.9 | 3.7 | 36.6 |
| | | | | 120 | 50.9 | 21.8 | 72.7 |
| | | | | 175 | 2.1 | 8.2 | 10.[illegible] |
| | | | | 250 | 2.3 | 13.3 | 15.7 |
| | | | | 500 | 3.1 | 28.0 | 31.2 |
| | | | | 750 | 0.7 | 6.7 | 7.5 |
| | | | | >750 | 0.7 | 6.7 | 7.5 |
| | | | Pressure Washers | 15 | 1.7 | 0.0 | 1.7 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 0.8 | 0.1 | 0.8 |
| | | | | 120 | 0.3 | 0.1 | 0.4 |
| | | | Pumps | 15 | 27.6 | 0.0 | 27.6 |
| | | | | 25 | 8.3 | 0.0 | 8.3 |
| | | | | 50 | 14.4 | 1.6 | 16.0 |
| | | | | 120 | 28.2 | 12.1 | 40.4 |
| | | | | 175 | 3.2 | 12.9 | 16.2 |
| | | | | 250 | 1.2 | 7.1 | 8.3 |
| | | | | 500 | 2.5 | 22.5 | 25.0 |
| | | | | >750 | 0.2 | 1.4 | 1.6 |
| | | | Welders | 15 | 12.5 | 0.0 | 12.5 |
| | | | | 25 | 11.0 | 0.0 | 11.0 |
| | | | | 50 | 33.8 | 3.8 | 37.6 |
| | | | | 120 | 26.3 | 11.3 | 37.5 |
| | | | | 175 | 0.1 | 0.5 | 0.6 |
| | | Napa | Air Compressors | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 3.5 | 0.4 | 3.9 |

# Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 120 | 23.4 | 10.0 | 33.5 |
| | | | | 175 | 0.9 | 3.7 | 4.6 |
| | | | | 250 | 1.3 | 7.2 | 8.4 |
| | | | | 500 | 1.1 | 10.0 | 11.1 |
| | | | | 750 | 0.0 | 0.4 | 0.5 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Generator Sets | 15 | 19.0 | 0.0 | 19.0 |
| | | | | 25 | 13.9 | 0.0 | 13.9 |
| | | | | 50 | 17.0 | 1.9 | 18.9 |
| | | | | 120 | 26.3 | 11.3 | 37.6 |
| | | | | 175 | 1.1 | 4.2 | 5.3 |
| | | | | 250 | 1.2 | 6.9 | 8.1 |
| | | | | 500 | 1.6 | 14.5 | 16.1 |
| | | | | 750 | 0.4 | 3.5 | 3.9 |
| | | | | >750 | 0.4 | 3.5 | 3.9 |
| | | | Pressure Washers | 15 | 0.9 | 0.0 | 0.9 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 0.4 | 0.0 | 0.4 |
| | | | | 120 | 0.2 | 0.1 | 0.2 |
| | | | Pumps | 15 | 14.3 | 0.0 | 14.3 |
| | | | | 25 | 4.3 | 0.0 | 4.3 |
| | | | | 50 | 7.4 | 0.8 | 8.3 |
| | | | | 120 | 14.6 | 6.3 | 20.9 |
| | | | | 175 | 1.7 | 6.7 | 8.4 |
| | | | | 250 | 0.6 | 3.7 | 4.3 |
| | | | | 500 | 1.3 | 11.6 | 12.9 |
| | | | | >750 | 0.1 | 0.7 | 0.8 |
| | | | Welders | 15 | 6.5 | 0.0 | 6.5 |
| | | | | 25 | 5.7 | 0.0 | 5.7 |
| | | | | 50 | 17.5 | 2.0 | 19.5 |
| | | | | 120 | 13.6 | 5.8 | 19.4 |
| | | | | 175 | 0.1 | 0.2 | 0.3 |
| | | San Francisco | Air Compressors | 15 | 1.2 | 0.0 | 1.2 |
| | | | | 25 | 2.4 | 0.0 | 2.4 |
| | | | | 50 | 21.5 | 2.3 | 23.8 |
| | | | | 120 | 143.5 | 61.5 | 205.0 |
| | | | | 175 | 5.6 | 22.5 | 28.1 |
| | | | | 250 | 7.7 | 43.8 | 51.6 |
| | | | | 500 | 6.8 | 61.4 | 68.2 |
| | | | | 750 | 0.3 | 2.5 | 2.8 |
| | | | | >750 | 0.1 | 0.7 | 0.8 |
| | | | Generator Sets | 15 | 116.7 | 0.0 | 116.7 |
| | | | | 25 | 85.3 | 0.0 | 85.3 |
| | | | | 50 | 104.3 | 11.6 | 116.0 |
| | | | | 120 | 161.3 | 69.1 | 230.4 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 175 | 6.5 | 26.0 | 32.5 |
| | | | | 250 | 7.4 | 42.2 | 49.7 |
| | | | | 500 | 9.9 | 88.9 | 98.8 |
| | | | | 750 | 2.4 | 21.3 | 23.6 |
| | | | | >750 | 2.4 | 21.3 | 23.6 |
| | | | Pressure Washers | 15 | 5.4 | 0.0 | 5.4 |
| | | | | 25 | 1.3 | 0.0 | 1.3 |
| | | | | 50 | 2.5 | 0.2 | 2.7 |
| | | | | 120 | 1.0 | 0.4 | 1.4 |
| | | | Pumps | 15 | 87.6 | 0.0 | 87.6 |
| | | | | 25 | 26.2 | 0.0 | 26.2 |
| | | | | 50 | 45.6 | 5.0 | 50.6 |
| | | | | 120 | 89.5 | 38.4 | 128.0 |
| | | | | 175 | 10.3 | 41.1 | 51.3 |
| | | | | 250 | 3.9 | 22.4 | 26.4 |
| | | | | 500 | 7.9 | 71.2 | 79.1 |
| | | | | >750 | 0.5 | 4.4 | 4.9 |
| | | | Welders | 15 | 39.6 | 0.0 | 39.6 |
| | | | | 25 | 34.9 | 0.0 | 34.9 |
| | | | | 50 | 107.3 | 12.0 | 119.3 |
| | | | | 120 | 83.3 | 35.7 | 119.[illegible] |
| | | | | 175 | 0.4 | 1.5 | 1.9 |
| | | San Mateo | Air Compressors | 15 | 1.1 | 0.0 | 1.1 |
| | | | | 25 | 2.2 | 0.0 | 2.2 |
| | | | | 50 | 19.4 | 2.1 | 21.5 |
| | | | | 120 | 129.7 | 55.6 | 185.2 |
| | | | | 175 | 5.1 | 20.3 | 25.4 |
| | | | | 250 | 7.0 | 39.6 | 46.6 |
| | | | | 500 | 6.2 | 55.5 | 61.6 |
| | | | | 750 | 0.3 | 2.3 | 2.5 |
| | | | | >750 | 0.1 | 0.6 | 0.7 |
| | | | Generator Sets | 15 | 105.4 | 0.0 | 105.4 |
| | | | | 25 | 77.1 | 0.0 | 77.1 |
| | | | | 50 | 94.3 | 10.5 | 104.8 |
| | | | | 120 | 145.8 | 62.4 | 208.3 |
| | | | | 175 | 5.9 | 23.5 | 29.4 |
| | | | | 250 | 6.7 | 38.2 | 44.9 |
| | | | | 500 | 8.9 | 80.4 | 89.3 |
| | | | | 750 | 2.1 | 19.2 | 21.4 |
| | | | | >750 | 2.1 | 19.2 | 21.4 |
| | | | Pressure Washers | 15 | 4.9 | 0.0 | 4.9 |
| | | | | 25 | 1.1 | 0.0 | 1.1 |
| | | | | 50 | 2.3 | 0.2 | 2.4 |
| | | | | 120 | 0.9 | 0.3 | 1.2 |
| | | | Pumps | 15 | 79.2 | 0.0 | 79.2 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 25 | 23.7 | 0.0 | 23.7 |
| | | | | 50 | 41.2 | 4.5 | 45.7 |
| | | | | 120 | 80.9 | 34.7 | 115.7 |
| | | | | 175 | 9.3 | 37.1 | 46.4 |
| | | | | 250 | 3.6 | 20.3 | 23.8 |
| | | | | 500 | 7.2 | 64.4 | 71.5 |
| | | | | >750 | 0.5 | 4.0 | 4.5 |
| | | | Welders | 15 | 35.8 | 0.0 | 35.8 |
| | | | | 25 | 31.5 | 0.0 | 31.5 |
| | | | | 50 | 97.0 | 10.8 | 107.8 |
| | | | | 120 | 75.3 | 32.3 | 107.6 |
| | | | | 175 | 0.4 | 1.4 | 1.7 |
| | | Santa Clara | Air Compressors | 15 | 2.6 | 0.0 | 2.6 |
| | | | | 25 | 5.3 | 0.0 | 5.3 |
| | | | | 50 | 46.7 | 5.1 | 51.8 |
| | | | | 120 | 312.2 | 133.8 | 446.0 |
| | | | | 175 | 12.2 | 48.9 | 61.1 |
| | | | | 250 | 16.8 | 95.4 | 112.2 |
| | | | | 500 | 14.8 | 133.6 | 148.4 |
| | | | | 750 | 0.6 | 5.5 | 6.1 |
| | | | | >750 | 0.2 | 1.6 | 1.8 |
| | | | Generator Sets | 15 | 253.8 | 0.0 | 253.8 |
| | | | | 25 | 185.7 | 0.0 | 185.7 |
| | | | | 50 | 227.0 | 25.3 | 252.3 |
| | | | | 120 | 351.1 | 150.3 | 501.4 |
| | | | | 175 | 14.2 | 56.6 | 70.8 |
| | | | | 250 | 16.2 | 91.9 | 108.1 |
| | | | | 500 | 21.5 | 193.5 | 215.0 |
| | | | | 750 | 5.1 | 46.3 | 51.4 |
| | | | | >750 | 5.1 | 46.3 | 51.4 |
| | | | Pressure Washers | 15 | 11.8 | 0.0 | 11.8 |
| | | | | 25 | 2.7 | 0.0 | 2.7 |
| | | | | 50 | 5.4 | 0.4 | 5.8 |
| | | | | 120 | 2.2 | 0.8 | 3.0 |
| | | | Pumps | 15 | 190.6 | 0.0 | 190.6 |
| | | | | 25 | 56.9 | 0.0 | 56.9 |
| | | | | 50 | 99.2 | 10.8 | 110.1 |
| | | | | 120 | 194.8 | 83.6 | 278.4 |
| | | | | 175 | 22.3 | 89.3 | 111.7 |
| | | | | 250 | 8.6 | 48.8 | 57.4 |
| | | | | 500 | 17.2 | 155.0 | 172.2 |
| | | | | >750 | 1.1 | 9.6 | 10.7 |
| | | | Welders | 15 | 86.2 | 0.0 | 86.2 |
| | | | | 25 | 75.9 | 0.0 | 75.9 |
| | | | | 50 | 233.4 | 26.0 | 259.5 |
| | | | | 120 | 181.3 | 77.6 | 259.0 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 175 | 0.9 | 3.3 | 4.1 |
| | | Solano | Air Compressors | 15 | 0.4 | 0.0 | 0.4 |
| | | | | 25 | 0.9 | 0.0 | 0.9 |
| | | | | 50 | 7.7 | 0.8 | 8.5 |
| | | | | 120 | 51.5 | 22.1 | 73.5 |
| | | | | 175 | 2.0 | 8.1 | 10.1 |
| | | | | 250 | 2.8 | 15.7 | 18.5 |
| | | | | 500 | 2.4 | 22.0 | 24.5 |
| | | | | 750 | 0.1 | 0.9 | 1.0 |
| | | | | >750 | 0.0 | 0.3 | 0.3 |
| | | | Generator Sets | 15 | 41.8 | 0.0 | 41.8 |
| | | | | 25 | 30.6 | 0.0 | 30.6 |
| | | | | 50 | 37.4 | 4.2 | 41.6 |
| | | | | 120 | 57.9 | 24.8 | 82.7 |
| | | | | 175 | 2.3 | 9.3 | 11.7 |
| | | | | 250 | 2.7 | 15.2 | 17.8 |
| | | | | 500 | 3.5 | 31.9 | 35.4 |
| | | | | 750 | 0.8 | 7.6 | 8.5 |
| | | | | >750 | 0.8 | 7.6 | 8.5 |
| | | | Pressure Washers | 15 | 1.9 | 0.0 | 1.9 |
| | | | | 25 | 0.5 | 0.0 | 0.5 |
| | | | | 50 | 0.9 | 0.1 | 1.0 |
| | | | | 120 | 0.4 | 0.1 | 0.5 |
| | | | Pumps | 15 | 31.4 | 0.0 | 31.4 |
| | | | | 25 | 9.4 | 0.0 | 9.4 |
| | | | | 50 | 16.4 | 1.8 | 18.1 |
| | | | | 120 | 32.1 | 13.8 | 45.9 |
| | | | | 175 | 3.7 | 14.7 | 18.4 |
| | | | | 250 | 1.4 | 8.0 | 9.5 |
| | | | | 500 | 2.8 | 25.5 | 28.4 |
| | | | | >750 | 0.2 | 1.6 | 1.8 |
| | | | Welders | 15 | 14.2 | 0.0 | 14.2 |
| | | | | 25 | 12.5 | 0.0 | 12.5 |
| | | | | 50 | 38.5 | 4.3 | 42.8 |
| | | | | 120 | 29.9 | 12.8 | 42.7 |
| | | | | 175 | 0.1 | 0.5 | 0.7 |
| | | Sonoma | Air Compressors | 15 | 0.6 | 0.0 | 0.6 |
| | | | | 25 | 1.3 | 0.0 | 1.3 |
| | | | | 50 | 11.2 | 1.2 | 12.4 |
| | | | | 120 | 74.9 | 32.1 | 106.9 |
| | | | | 175 | 2.9 | 11.7 | 14.7 |
| | | | | 250 | 4.0 | 22.9 | 26.9 |
| | | | | 500 | 3.6 | 32.0 | 35.6 |
| | | | | 750 | 0.1 | 1.3 | 1.[illegible] |
| | | | | >750 | 0.0 | 0.4 | 0.4 |

# Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Generator Sets | 15 | 60.9 | 0.0 | 60.9 |
| | | | | 25 | 44.5 | 0.0 | 44.5 |
| | | | | 50 | 54.4 | 6.1 | 60.5 |
| | | | | 120 | 84.2 | 36.0 | 120.2 |
| | | | | 175 | 3.4 | 13.6 | 17.0 |
| | | | | 250 | 3.9 | 22.0 | 25.9 |
| | | | | 500 | 5.2 | 46.4 | 51.5 |
| | | | | 750 | 1.2 | 11.1 | 12.3 |
| | | | | >750 | 1.2 | 11.1 | 12.3 |
| | | | Pressure Washers | 15 | 2.8 | 0.0 | 2.8 |
| | | | | 25 | 0.7 | 0.0 | 0.7 |
| | | | | 50 | 1.3 | 0.1 | 1.4 |
| | | | | 120 | 0.5 | 0.2 | 0.7 |
| | | | Pumps | 15 | 45.7 | 0.0 | 45.7 |
| | | | | 25 | 13.7 | 0.0 | 13.7 |
| | | | | 50 | 23.8 | 2.6 | 26.4 |
| | | | | 120 | 46.7 | 20.1 | 66.8 |
| | | | | 175 | 5.4 | 21.4 | 26.8 |
| | | | | 250 | 2.1 | 11.7 | 13.8 |
| | | | | 500 | 4.1 | 37.1 | 41.3 |
| | | | | >750 | 0.3 | 2.3 | 2.6 |
| | | | Welders | 15 | 20.7 | 0.0 | 20.7 |
| | | | | 25 | 18.2 | 0.0 | 18.2 |
| | | | | 50 | 56.0 | 6.2 | 62.2 |
| | | | | 120 | 43.5 | 18.6 | 62.1 |
| | | | | 175 | 0.2 | 0.8 | 1.0 |
| Butte County AQMD | Sacramento Valley | Butte | Air Compressors | 15 | 0.3 | 0.0 | 0.3 |
| | | | | 25 | 0.6 | 0.0 | 0.6 |
| | | | | 50 | 5.7 | 0.6 | 6.3 |
| | | | | 120 | 37.9 | 16.3 | 54.2 |
| | | | | 175 | 1.5 | 5.9 | 7.4 |
| | | | | 250 | 2.0 | 11.6 | 13.6 |
| | | | | 500 | 1.8 | 16.2 | 18.0 |
| | | | | 750 | 0.1 | 0.7 | 0.7 |
| | | | | >750 | 0.0 | 0.2 | 0.2 |
| | | | Generator Sets | 15 | 30.8 | 0.0 | 30.8 |
| | | | | 25 | 22.6 | 0.0 | 22.6 |
| | | | | 50 | 27.6 | 3.1 | 30.7 |
| | | | | 120 | 42.7 | 18.3 | 60.9 |
| | | | | 175 | 1.7 | 6.9 | 8.6 |
| | | | | 250 | 2.0 | 11.2 | 13.1 |
| | | | | 500 | 2.6 | 23.5 | 26.1 |
| | | | | 750 | 0.6 | 5.6 | 6.2 |
| | | | | >750 | 0.6 | 5.6 | 6.2 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Pressure Washers | 15 | 1.4 | 0.0 | 1.4 |
| | | | | 25 | 0.3 | 0.0 | 0.3 |
| | | | | 50 | 0.7 | 0.0 | 0.7 |
| | | | | 120 | 0.3 | 0.1 | 0.4 |
| | | | Pumps | 15 | 23.2 | 0.0 | 23.2 |
| | | | | 25 | 6.9 | 0.0 | 6.9 |
| | | | | 50 | 12.1 | 1.3 | 13.4 |
| | | | | 120 | 23.7 | 10.2 | 33.8 |
| | | | | 175 | 2.7 | 10.9 | 13.6 |
| | | | | 250 | 1.0 | 5.9 | 7.0 |
| | | | | 500 | 2.1 | 18.8 | 20.9 |
| | | | | >750 | 0.1 | 1.2 | 1.3 |
| | | | Welders | 15 | 10.5 | 0.0 | 10.5 |
| | | | | 25 | 9.2 | 0.0 | 9.2 |
| | | | | 50 | 28.4 | 3.2 | 31.5 |
| | | | | 120 | 22.0 | 9.4 | 31.5 |
| | | | | 175 | 0.1 | 0.4 | 0.5 |
| Calaveras County AQMD | Mountain Counties | Calaveras | Air Compressors | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 1.1 | 0.1 | 1.3 |
| | | | | 120 | 7.7 | 3.3 | 11.0 |
| | | | | 175 | 0.3 | 1.2 | 1.5 |
| | | | | 250 | 0.4 | 2.3 | 2.8 |
| | | | | 500 | 0.4 | 3.3 | 3.6 |
| | | | | 750 | 0.0 | 0.1 | 0.1 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 6.2 | 0.0 | 6.2 |
| | | | | 25 | 4.6 | 0.0 | 4.6 |
| | | | | 50 | 5.6 | 0.6 | 6.2 |
| | | | | 120 | 8.6 | 3.7 | 12.3 |
| | | | | 175 | 0.3 | 1.4 | 1.7 |
| | | | | 250 | 0.4 | 2.3 | 2.7 |
| | | | | 500 | 0.5 | 4.8 | 5.3 |
| | | | | 750 | 0.1 | 1.1 | 1.3 |
| | | | | >750 | 0.1 | 1.1 | 1.3 |
| | | | Pressure Washers | 15 | 0.3 | 0.0 | 0.3 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.1 | 0.0 | 0.1 |
| | | | | 120 | 0.1 | 0.0 | 0.1 |
| | | | Pumps | 15 | 4.7 | 0.0 | 4.7 |
| | | | | 25 | 1.4 | 0.0 | 1.4 |
| | | | | 50 | 2.4 | 0.3 | 2.7 |
| | | | | 120 | 4.8 | 2.1 | 6.8 |
| | | | | 175 | 0.5 | 2.2 | 2.7 |
| | | | | 250 | 0.2 | 1.2 | 1.4 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 500 | 0.4 | 3.8 | 4.2 |
| | | | | >750 | 0.0 | 0.2 | 0.3 |
| | | | Welders | 15 | 2.1 | 0.0 | 2.1 |
| | | | | 25 | 1.9 | 0.0 | 1.9 |
| | | | | 50 | 5.7 | 0.6 | 6.4 |
| | | | | 120 | 4.5 | 1.9 | 6.4 |
| | | | | 175 | 0.0 | 0.1 | 0.1 |
| Colusa County APCD | Sacramento Valley | Colusa | Air Compressors | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.5 | 0.1 | 0.6 |
| | | | | 120 | 3.6 | 1.5 | 5.1 |
| | | | | 175 | 0.1 | 0.6 | 0.7 |
| | | | | 250 | 0.2 | 1.1 | 1.3 |
| | | | | 500 | 0.2 | 1.5 | 1.7 |
| | | | | 750 | 0.0 | 0.1 | 0.1 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 2.9 | 0.0 | 2.9 |
| | | | | 25 | 2.1 | 0.0 | 2.1 |
| | | | | 50 | 2.6 | 0.3 | 2.9 |
| | | | | 120 | 4.0 | 1.7 | 5.7 |
| | | | | 175 | 0.2 | 0.6 | 0.8 |
| | | | | 250 | 0.2 | 1.0 | 1.2 |
| | | | | 500 | 0.2 | 2.2 | 2.4 |
| | | | | 750 | 0.1 | 0.5 | 0.6 |
| | | | | >750 | 0.1 | 0.5 | 0.6 |
| | | | Pressure Washers | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.1 | 0.0 | 0.1 |
| | | | | 120 | 0.0 | 0.0 | 0.0 |
| | | | Pumps | 15 | 2.2 | 0.0 | 2.2 |
| | | | | 25 | 0.6 | 0.0 | 0.6 |
| | | | | 50 | 1.1 | 0.1 | 1.3 |
| | | | | 120 | 2.2 | 1.0 | 3.2 |
| | | | | 175 | 0.3 | 1.0 | 1.3 |
| | | | | 250 | 0.1 | 0.6 | 0.7 |
| | | | | 500 | 0.2 | 1.8 | 2.0 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Welders | 15 | 1.0 | 0.0 | 1.0 |
| | | | | 25 | 0.9 | 0.0 | 0.9 |
| | | | | 50 | 2.7 | 0.3 | 3.0 |
| | | | | 120 | 2.1 | 0.9 | 2.9 |
| | | | | 175 | 0.0 | 0.0 | 0.0 |
| El Dorado County APCD | Lake Tahoe | El Dorado | Air Compressors | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 1.0 | 0.1 | 1.1 |

**Attachment F**

**2002 OFFROAD-PSR Stationary Diesel Population**

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| **District** | **Air Basin** | **County** | **Equipment Type** | **Horsepower Class** | **Mobile** | **Stationary** | **Total** |
| | | | | 120 | 6.5 | 2.8 | 9.3 |
| | | | | 175 | 0.3 | 1.0 | 1.3 |
| | | | | 250 | 0.4 | 2.0 | 2.3 |
| | | | | 500 | 0.3 | 2.8 | 3.1 |
| | | | | 750 | 0.0 | 0.1 | 0.1 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 5.3 | 0.0 | 5.3 |
| | | | | 25 | 3.9 | 0.0 | 3.9 |
| | | | | 50 | 4.8 | 0.5 | 5.3 |
| | | | | 120 | 7.4 | 3.1 | 10.5 |
| | | | | 175 | 0.3 | 1.2 | 1.5 |
| | | | | 250 | 0.3 | 1.9 | 2.3 |
| | | | | 500 | 0.5 | 4.1 | 4.5 |
| | | | | 750 | 0.1 | 1.0 | 1.1 |
| | | | | >750 | 0.1 | 1.0 | 1.1 |
| | | | Pressure Washers | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.1 | 0.0 | 0.1 |
| | | | | 120 | 0.0 | 0.0 | 0.1 |
| | | | Pumps | 15 | 4.0 | 0.0 | 4.0 |
| | | | | 25 | 1.2 | 0.0 | 1.2 |
| | | | | 50 | 2.1 | 0.2 | 2.3 |
| | | | | 120 | 4.1 | 1.8 | 5.8 |
| | | | | 175 | 0.5 | 1.9 | 2.3 |
| | | | | 250 | 0.2 | 1.0 | 1.2 |
| | | | | 500 | 0.4 | 3.2 | 3.6 |
| | | | | >750 | 0.0 | 0.2 | 0.2 |
| | | | Welders | 15 | 1.8 | 0.0 | 1.8 |
| | | | | 25 | 1.6 | 0.0 | 1.6 |
| | | | | 50 | 4.9 | 0.5 | 5.4 |
| | | | | 120 | 3.8 | 1.6 | 5.4 |
| | | | | 175 | 0.0 | 0.1 | 0.1 |
| | Mountain Counties | | Air Compressors | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 3.5 | 0.4 | 3.9 |
| | | | | 120 | 23.5 | 10.1 | 33.5 |
| | | | | 175 | 0.9 | 3.7 | 4.6 |
| | | | | 250 | 1.3 | 7.2 | 8.4 |
| | | | | 500 | 1.1 | 10.0 | 11.2 |
| | | | | 750 | 0.0 | 0.4 | 0.5 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Generator Sets | 15 | 19.1 | 0.0 | 19.1 |
| | | | | 25 | 14.0 | 0.0 | 14.0 |
| | | | | 50 | 17.1 | 1.9 | 19.[illegible] |
| | | | | 120 | 26.4 | 11.3 | 37.7 |

## Attachment F
## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 175 | 1.1 | 4.3 | 5.3 |
| | | | | 250 | 1.2 | 6.9 | 8.1 |
| | | | | 500 | 1.6 | 14.5 | 16.2 |
| | | | | 750 | 0.4 | 3.5 | 3.9 |
| | | | | >750 | 0.4 | 3.5 | 3.9 |
| | | | Pressure Washers | 15 | 0.9 | 0.0 | 0.9 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 0.4 | 0.0 | 0.4 |
| | | | | 120 | 0.2 | 0.1 | 0.2 |
| | | | Pumps | 15 | 14.3 | 0.0 | 14.3 |
| | | | | 25 | 4.3 | 0.0 | 4.3 |
| | | | | 50 | 7.5 | 0.8 | 8.3 |
| | | | | 120 | 14.6 | 6.3 | 20.9 |
| | | | | 175 | 1.7 | 6.7 | 8.4 |
| | | | | 250 | 0.6 | 3.7 | 4.3 |
| | | | | 500 | 1.3 | 11.6 | 12.9 |
| | | | | >750 | 0.1 | 0.7 | 0.8 |
| | | | Welders | 15 | 6.5 | 0.0 | 6.5 |
| | | | | 25 | 5.7 | 0.0 | 5.7 |
| | | | | 50 | 17.6 | 2.0 | 19.5 |
| | | | | 120 | 13.6 | 5.8 | 19.5 |
| | | | | 175 | 0.1 | 0.2 | 0.3 |
| Feather River AQMD | Sacramento Valley | Sutter | Air Compressors | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.3 | 0.0 | 0.3 |
| | | | | 50 | 2.2 | 0.2 | 2.5 |
| | | | | 120 | 15.0 | 6.4 | 21.4 |
| | | | | 175 | 0.6 | 2.3 | 2.9 |
| | | | | 250 | 0.8 | 4.6 | 5.4 |
| | | | | 500 | 0.7 | 6.4 | 7.1 |
| | | | | 750 | 0.0 | 0.3 | 0.3 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Generator Sets | 15 | 12.2 | 0.0 | 12.2 |
| | | | | 25 | 8.9 | 0.0 | 8.9 |
| | | | | 50 | 10.9 | 1.2 | 12.1 |
| | | | | 120 | 16.9 | 7.2 | 24.1 |
| | | | | 175 | 0.7 | 2.7 | 3.4 |
| | | | | 250 | 0.8 | 4.4 | 5.2 |
| | | | | 500 | 1.0 | 9.3 | 10.3 |
| | | | | 750 | 0.2 | 2.2 | 2.5 |
| | | | | >750 | 0.2 | 2.2 | 2.5 |
| | | | Pressure Washers | 15 | 0.6 | 0.0 | 0.6 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.3 | 0.0 | 0.3 |
| | | | | 120 | 0.1 | 0.0 | 0.1 |
| | | | Pumps | 15 | 9.2 | 0.0 | 9.2 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 25 | 2.7 | 0.0 | 2.7 |
| | | | | 50 | 4.8 | 0.5 | 5.3 |
| | | | | 120 | 9.4 | 4.0 | 13.4 |
| | | | | 175 | 1.1 | 4.3 | 5.4 |
| | | | | 250 | 0.4 | 2.3 | 2.8 |
| | | | | 500 | 0.8 | 7.4 | 8.3 |
| | | | | >750 | 0.1 | 0.5 | 0.5 |
| | | | Welders | 15 | 4.1 | 0.0 | 4.1 |
| | | | | 25 | 3.6 | 0.0 | 3.6 |
| | | | | 50 | 11.2 | 1.3 | 12.5 |
| | | | | 120 | 8.7 | 3.7 | 12.4 |
| | | | | 175 | 0.0 | 0.2 | 0.2 |
| | | Yuba | Air Compressors | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 1.7 | 0.2 | 1.9 |
| | | | | 120 | 11.3 | 4.9 | 16.2 |
| | | | | 175 | 0.4 | 1.8 | 2.2 |
| | | | | 250 | 0.6 | 3.5 | 4.1 |
| | | | | 500 | 0.5 | 4.9 | 5.4 |
| | | | | 750 | 0.0 | 0.2 | 0.2 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Generator Sets | 15 | 9.2 | 0.0 | 9.2 |
| | | | | 25 | 6.7 | 0.0 | 6.7 |
| | | | | 50 | 8.2 | 0.9 | 9.2 |
| | | | | 120 | 12.7 | 5.5 | 18.2 |
| | | | | 175 | 0.5 | 2.1 | 2.6 |
| | | | | 250 | 0.6 | 3.3 | 3.9 |
| | | | | 500 | 0.8 | 7.0 | 7.8 |
| | | | | 750 | 0.2 | 1.7 | 1.9 |
| | | | | >750 | 0.2 | 1.7 | 1.9 |
| | | | Pressure Washers | 15 | 0.4 | 0.0 | 0.4 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.2 | 0.0 | 0.2 |
| | | | | 120 | 0.1 | 0.0 | 0.1 |
| | | | Pumps | 15 | 6.9 | 0.0 | 6.9 |
| | | | | 25 | 2.1 | 0.0 | 2.1 |
| | | | | 50 | 3.6 | 0.4 | 4.0 |
| | | | | 120 | 7.1 | 3.0 | 10.1 |
| | | | | 175 | 0.8 | 3.2 | 4.1 |
| | | | | 250 | 0.3 | 1.8 | 2.1 |
| | | | | 500 | 0.6 | 5.6 | 6.3 |
| | | | | >750 | 0.0 | 0.3 | 0.4 |
| | | | Welders | 15 | 3.1 | 0.0 | 3.1 |
| | | | | 25 | 2.8 | 0.0 | 2.8 |
| | | | | 50 | 8.5 | 0.9 | 9.4 |
| | | | | 120 | 6.6 | 2.8 | 9.4 |

## Attachment F
## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 175 | 0.0 | 0.1 | 0.2 |
| Glenn County APCD | | Glenn | Air Compressors | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.7 | 0.1 | 0.8 |
| | | | | 120 | 4.9 | 2.1 | 7.0 |
| | | | | 175 | 0.2 | 0.8 | 1.0 |
| | | | | 250 | 0.3 | 1.5 | 1.8 |
| | | | | 500 | 0.2 | 2.1 | 2.3 |
| | | | | 750 | 0.0 | 0.1 | 0.1 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 4.0 | 0.0 | 4.0 |
| | | | | 25 | 2.9 | 0.0 | 2.9 |
| | | | | 50 | 3.5 | 0.4 | 3.9 |
| | | | | 120 | 5.5 | 2.3 | 7.8 |
| | | | | 175 | 0.2 | 0.9 | 1.1 |
| | | | | 250 | 0.3 | 1.4 | 1.7 |
| | | | | 500 | 0.3 | 3.0 | 3.4 |
| | | | | 750 | 0.1 | 0.7 | 0.8 |
| | | | | >750 | 0.1 | 0.7 | 0.8 |
| | | | Pressure Washers | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.1 | 0.0 | 0.1 |
| | | | | 120 | 0.0 | 0.0 | 0.0 |
| | | | Pumps | 15 | 3.0 | 0.0 | 3.0 |
| | | | | 25 | 0.9 | 0.0 | 0.9 |
| | | | | 50 | 1.6 | 0.2 | 1.7 |
| | | | | 120 | 3.0 | 1.3 | 4.4 |
| | | | | 175 | 0.3 | 1.4 | 1.7 |
| | | | | 250 | 0.1 | 0.8 | 0.9 |
| | | | | 500 | 0.3 | 2.4 | 2.7 |
| | | | | >750 | 0.0 | 0.2 | 0.2 |
| | | | Welders | 15 | 1.3 | 0.0 | 1.3 |
| | | | | 25 | 1.2 | 0.0 | 1.2 |
| | | | | 50 | 3.6 | 0.4 | 4.1 |
| | | | | 120 | 2.8 | 1.2 | 4.0 |
| | | | | 175 | 0.0 | 0.1 | 0.1 |
| Great Basin Unified APCD | Great Basin Valleys | Alpine | Air Compressors | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.0 | 0.0 | 0.0 |
| | | | | 120 | 0.2 | 0.1 | 0.3 |
| | | | | 175 | 0.0 | 0.0 | 0.0 |
| | | | | 250 | 0.0 | 0.1 | 0.1 |
| | | | | 500 | 0.0 | 0.1 | 0.1 |
| | | | | 750 | 0.0 | 0.0 | 0.0 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Generator Sets | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.2 | 0.0 | 0.2 |
| | | | | 120 | 0.3 | 0.1 | 0.4 |
| | | | | 175 | 0.0 | 0.0 | 0.1 |
| | | | | 250 | 0.0 | 0.1 | 0.1 |
| | | | | 500 | 0.0 | 0.1 | 0.2 |
| | | | | 750 | 0.0 | 0.0 | 0.0 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Pressure Washers | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.0 | 0.0 | 0.0 |
| | | | | 120 | 0.0 | 0.0 | 0.0 |
| | | | Pumps | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.1 | 0.0 | 0.1 |
| | | | | 120 | 0.1 | 0.1 | 0.2 |
| | | | | 175 | 0.0 | 0.1 | 0.1 |
| | | | | 250 | 0.0 | 0.0 | 0.0 |
| | | | | 500 | 0.0 | 0.1 | 0.1 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Welders | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.2 | 0.0 | 0.2 |
| | | | | 120 | 0.1 | 0.1 | 0.2 |
| | | | | 175 | 0.0 | 0.0 | 0.0 |
| | | Inyo | Air Compressors | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.5 | 0.1 | 0.5 |
| | | | | 120 | 3.3 | 1.4 | 4.7 |
| | | | | 175 | 0.1 | 0.5 | 0.6 |
| | | | | 250 | 0.2 | 1.0 | 1.2 |
| | | | | 500 | 0.2 | 1.4 | 1.6 |
| | | | | 750 | 0.0 | 0.1 | 0.1 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 2.7 | 0.0 | 2.7 |
| | | | | 25 | 2.0 | 0.0 | 2.0 |
| | | | | 50 | 2.4 | 0.3 | 2.7 |
| | | | | 120 | 3.7 | 1.6 | 5.3 |
| | | | | 175 | 0.2 | 0.6 | 0.8 |
| | | | | 250 | 0.2 | 1.0 | 1.1 |
| | | | | 500 | 0.2 | 2.1 | 2.3 |
| | | | | 750 | 0.1 | 0.5 | 0.5 |
| | | | | >750 | 0.1 | 0.5 | 0.5 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Pressure Washers | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.1 | 0.0 | 0.1 |
| | | | | 120 | 0.0 | 0.0 | 0.0 |
| | | | Pumps | 15 | 2.0 | 0.0 | 2.0 |
| | | | | 25 | 0.6 | 0.0 | 0.6 |
| | | | | 50 | 1.1 | 0.1 | 1.2 |
| | | | | 120 | 2.1 | 0.9 | 3.0 |
| | | | | 175 | 0.2 | 0.9 | 1.2 |
| | | | | 250 | 0.1 | 0.5 | 0.6 |
| | | | | 500 | 0.2 | 1.6 | 1.8 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Welders | 15 | 0.9 | 0.0 | 0.9 |
| | | | | 25 | 0.8 | 0.0 | 0.8 |
| | | | | 50 | 2.5 | 0.3 | 2.8 |
| | | | | 120 | 1.9 | 0.8 | 2.8 |
| | | | | 175 | 0.0 | 0.0 | 0.0 |
| | | Mono | Air Compressors | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.4 | 0.0 | 0.4 |
| | | | | 120 | 2.4 | 1.0 | 3.5 |
| | | | | 175 | 0.1 | 0.4 | 0.5 |
| | | | | 250 | 0.1 | 0.7 | 0.9 |
| | | | | 500 | 0.1 | 1.0 | 1.2 |
| | | | | 750 | 0.0 | 0.0 | 0.0 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 2.0 | 0.0 | 2.0 |
| | | | | 25 | 1.4 | 0.0 | 1.4 |
| | | | | 50 | 1.8 | 0.2 | 2.0 |
| | | | | 120 | 2.7 | 1.2 | 3.9 |
| | | | | 175 | 0.1 | 0.4 | 0.5 |
| | | | | 250 | 0.1 | 0.7 | 0.8 |
| | | | | 500 | 0.2 | 1.5 | 1.7 |
| | | | | 750 | 0.0 | 0.4 | 0.4 |
| | | | | >750 | 0.0 | 0.4 | 0.4 |
| | | | Pressure Washers | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.0 | 0.0 | 0.0 |
| | | | | 120 | 0.0 | 0.0 | 0.0 |
| | | | Pumps | 15 | 1.5 | 0.0 | 1.5 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 0.8 | 0.1 | 0.9 |
| | | | | 120 | 1.5 | 0.6 | 2.2 |
| | | | | 175 | 0.2 | 0.7 | 0.9 |
| | | | | 250 | 0.1 | 0.4 | 0.4 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 500 | 0.1 | 1.2 | 1.3 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Welders | 15 | 0.7 | 0.0 | 0.7 |
| | | | | 25 | 0.6 | 0.0 | 0.6 |
| | | | | 50 | 1.8 | 0.2 | 2.0 |
| | | | | 120 | 1.4 | 0.6 | 2.0 |
| | | | | 175 | 0.0 | 0.0 | 0.0 |
| Imperial County APCD | Salton Sea | Imperial | Air Compressors | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.5 | 0.0 | 0.5 |
| | | | | 50 | 4.1 | 0.4 | 4.6 |
| | | | | 120 | 27.6 | 11.8 | 39.4 |
| | | | | 175 | 1.1 | 4.3 | 5.4 |
| | | | | 250 | 1.5 | 8.4 | 9.9 |
| | | | | 500 | 1.3 | 11.8 | 13.1 |
| | | | | 750 | 0.1 | 0.5 | 0.5 |
| | | | | >750 | 0.0 | 0.1 | 0.2 |
| | | | Generator Sets | 15 | 22.4 | 0.0 | 22.4 |
| | | | | 25 | 16.4 | 0.0 | 16.4 |
| | | | | 50 | 20.1 | 2.2 | 22.3 |
| | | | | 120 | 31.0 | 13.3 | 44.3 |
| | | | | 175 | 1.3 | 5.0 | 6.3 |
| | | | | 250 | 1.4 | 8.1 | 9.6 |
| | | | | 500 | 1.9 | 17.1 | 19.0 |
| | | | | 750 | 0.5 | 4.1 | 4.5 |
| | | | | >750 | 0.5 | 4.1 | 4.5 |
| | | | Pressure Washers | 15 | 1.0 | 0.0 | 1.0 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 0.5 | 0.0 | 0.5 |
| | | | | 120 | 0.2 | 0.1 | 0.3 |
| | | | Pumps | 15 | 16.8 | 0.0 | 16.8 |
| | | | | 25 | 5.0 | 0.0 | 5.0 |
| | | | | 50 | 8.8 | 1.0 | 9.7 |
| | | | | 120 | 17.2 | 7.4 | 24.6 |
| | | | | 175 | 2.0 | 7.9 | 9.9 |
| | | | | 250 | 0.8 | 4.3 | 5.1 |
| | | | | 500 | 1.5 | 13.7 | 15.2 |
| | | | | >750 | 0.1 | 0.9 | 0.9 |
| | | | Welders | 15 | 7.6 | 0.0 | 7.6 |
| | | | | 25 | 6.7 | 0.0 | 6.7 |
| | | | | 50 | 20.6 | 2.3 | 22.9 |
| | | | | 120 | 16.0 | 6.9 | 22.9 |
| | | | | 175 | 0.1 | 0.3 | 0.4 |
| Kern County APCD | Mojave Desert | Kern | Air Compressors | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 3.2 | 0.3 | 3.6 |

## Attachment F
## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 120 | 21.5 | 9.2 | 30.7 |
| | | | | 175 | 0.8 | 3.4 | 4.2 |
| | | | | 250 | 1.2 | 6.6 | 7.7 |
| | | | | 500 | 1.0 | 9.2 | 10.2 |
| | | | | 750 | 0.0 | 0.4 | 0.4 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Generator Sets | 15 | 17.5 | 0.0 | 17.5 |
| | | | | 25 | 12.8 | 0.0 | 12.8 |
| | | | | 50 | 15.6 | 1.7 | 17.4 |
| | | | | 120 | 24.1 | 10.3 | 34.5 |
| | | | | 175 | 1.0 | 3.9 | 4.9 |
| | | | | 250 | 1.1 | 6.3 | 7.4 |
| | | | | 500 | 1.5 | 13.3 | 14.8 |
| | | | | 750 | 0.4 | 3.2 | 3.5 |
| | | | | >750 | 0.4 | 3.2 | 3.5 |
| | | | Pressure Washers | 15 | 0.8 | 0.0 | 0.8 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 0.4 | 0.0 | 0.4 |
| | | | | 120 | 0.2 | 0.1 | 0.2 |
| | | | Pumps | 15 | 13.1 | 0.0 | 13.1 |
| | | | | 25 | 3.9 | 0.0 | 3.9 |
| | | | | 50 | 6.8 | 0.7 | 7.6 |
| | | | | 120 | 13.4 | 5.8 | 19.2 |
| | | | | 175 | 1.5 | 6.1 | 7.7 |
| | | | | 250 | 0.6 | 3.4 | 3.9 |
| | | | | 500 | 1.2 | 10.7 | 11.8 |
| | | | | >750 | 0.1 | 0.7 | 0.7 |
| | | | Welders | 15 | 5.9 | 0.0 | 5.9 |
| | | | | 25 | 5.2 | 0.0 | 5.2 |
| | | | | 50 | 16.1 | 1.8 | 17.8 |
| | | | | 120 | 12.5 | 5.3 | 17.8 |
| | | | | 175 | 0.1 | 0.2 | 0.3 |
| Lake County AQMD | Lake County | Lake | Air Compressors | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 1.7 | 0.2 | 1.8 |
| | | | | 120 | 11.1 | 4.8 | 15.9 |
| | | | | 175 | 0.4 | 1.7 | 2.2 |
| | | | | 250 | 0.6 | 3.4 | 4.0 |
| | | | | 500 | 0.5 | 4.7 | 5.3 |
| | | | | 750 | 0.0 | 0.2 | 0.2 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Generator Sets | 15 | 9.0 | 0.0 | 9.0 |
| | | | | 25 | 6.6 | 0.0 | 6.6 |
| | | | | 50 | 8.1 | 0.9 | 9.0 |
| | | | | 120 | 12.5 | 5.3 | 17.8 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 175 | 0.5 | 2.0 | 2.5 |
| | | | | 250 | 0.6 | 3.3 | 3.8 |
| | | | | 500 | 0.8 | 6.9 | 7.6 |
| | | | | 750 | 0.2 | 1.6 | 1.8 |
| | | | | >750 | 0.2 | 1.6 | 1.8 |
| | | | Pressure Washers | 15 | 0.4 | 0.0 | 0.4 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.2 | 0.0 | 0.2 |
| | | | | 120 | 0.1 | 0.0 | 0.1 |
| | | | Pumps | 15 | 6.8 | 0.0 | 6.8 |
| | | | | 25 | 2.0 | 0.0 | 2.0 |
| | | | | 50 | 3.5 | 0.4 | 3.9 |
| | | | | 120 | 6.9 | 3.0 | 9.9 |
| | | | | 175 | 0.8 | 3.2 | 4.0 |
| | | | | 250 | 0.3 | 1.7 | 2.0 |
| | | | | 500 | 0.6 | 5.5 | 6.1 |
| | | | | >750 | 0.0 | 0.3 | 0.4 |
| | | | Welders | 15 | 3.1 | 0.0 | 3.1 |
| | | | | 25 | 2.7 | 0.0 | 2.7 |
| | | | | 50 | 8.3 | 0.9 | 9.2 |
| | | | | 120 | 6.4 | 2.8 | 9.2 |
| | | | | 175 | 0.0 | 0.1 | 0.1 |
| Lassen County APCD | Northeast Plateau | Lassen | Air Compressors | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.9 | 0.1 | 1.0 |
| | | | | 120 | 6.2 | 2.7 | 8.9 |
| | | | | 175 | 0.2 | 1.0 | 1.2 |
| | | | | 250 | 0.3 | 1.9 | 2.2 |
| | | | | 500 | 0.3 | 2.7 | 2.9 |
| | | | | 750 | 0.0 | 0.1 | 0.1 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 5.0 | 0.0 | 5.0 |
| | | | | 25 | 3.7 | 0.0 | 3.7 |
| | | | | 50 | 4.5 | 0.5 | 5.0 |
| | | | | 120 | 7.0 | 3.0 | 10.0 |
| | | | | 175 | 0.3 | 1.1 | 1.4 |
| | | | | 250 | 0.3 | 1.8 | 2.1 |
| | | | | 500 | 0.4 | 3.8 | 4.3 |
| | | | | 750 | 0.1 | 0.9 | 1.0 |
| | | | | >750 | 0.1 | 0.9 | 1.0 |
| | | | Pressure Washers | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.1 | 0.0 | 0.1 |
| | | | | 120 | 0.0 | 0.0 | 0.1 |
| | | | Pumps | 15 | 3.8 | 0.0 | 3.8 |

## Attachment F
## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 25 | 1.1 | 0.0 | 1.1 |
| | | | | 50 | 2.0 | 0.2 | 2.2 |
| | | | | 120 | 3.9 | 1.7 | 5.5 |
| | | | | 175 | 0.4 | 1.8 | 2.2 |
| | | | | 250 | 0.2 | 1.0 | 1.1 |
| | | | | 500 | 0.3 | 3.1 | 3.4 |
| | | | | >750 | 0.0 | 0.2 | 0.2 |
| | | | Welders | 15 | 1.7 | 0.0 | 1.7 |
| | | | | 25 | 1.5 | 0.0 | 1.5 |
| | | | | 50 | 4.6 | 0.5 | 5.2 |
| | | | | 120 | 3.6 | 1.5 | 5.1 |
| | | | | 175 | 0.0 | 0.1 | 0.1 |
| Mariposa County APCD | Mountain Counties | Mariposa | Air Compressors | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.5 | 0.1 | 0.5 |
| | | | | 120 | 3.2 | 1.4 | 4.5 |
| | | | | 175 | 0.1 | 0.5 | 0.6 |
| | | | | 250 | 0.2 | 1.0 | 1.1 |
| | | | | 500 | 0.2 | 1.4 | 1.5 |
| | | | | 750 | 0.0 | 0.1 | 0.1 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 2.6 | 0.0 | 2.6 |
| | | | | 25 | 1.9 | 0.0 | 1.9 |
| | | | | 50 | 2.3 | 0.3 | 2.6 |
| | | | | 120 | 3.6 | 1.5 | 5.1 |
| | | | | 175 | 0.1 | 0.6 | 0.7 |
| | | | | 250 | 0.2 | 0.9 | 1.1 |
| | | | | 500 | 0.2 | 2.0 | 2.2 |
| | | | | 750 | 0.1 | 0.5 | 0.5 |
| | | | | >750 | 0.1 | 0.5 | 0.5 |
| | | | Pressure Washers | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.1 | 0.0 | 0.1 |
| | | | | 120 | 0.0 | 0.0 | 0.0 |
| | | | Pumps | 15 | 1.9 | 0.0 | 1.9 |
| | | | | 25 | 0.6 | 0.0 | 0.6 |
| | | | | 50 | 1.0 | 0.1 | 1.1 |
| | | | | 120 | 2.0 | 0.8 | 2.8 |
| | | | | 175 | 0.2 | 0.9 | 1.1 |
| | | | | 250 | 0.1 | 0.5 | 0.6 |
| | | | | 500 | 0.2 | 1.6 | 1.7 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Welders | 15 | 0.9 | 0.0 | 0.9 |
| | | | | 25 | 0.8 | 0.0 | 0.8 |
| | | | | 50 | 2.4 | 0.3 | 2.6 |
| | | | | 120 | 1.8 | 0.8 | 2.6 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 175 | 0.0 | 0.0 | 0.0 |
| Mendocino County AQMD | North Coast | Mendocino | Air Compressors | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.3 | 0.0 | 0.3 |
| | | | | 50 | 2.4 | 0.3 | 2.6 |
| | | | | 120 | 16.0 | 6.8 | 22.8 |
| | | | | 175 | 0.6 | 2.5 | 3.1 |
| | | | | 250 | 0.9 | 4.9 | 5.7 |
| | | | | 500 | 0.8 | 6.8 | 7.6 |
| | | | | 750 | 0.0 | 0.3 | 0.3 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Generator Sets | 15 | 13.0 | 0.0 | 13.0 |
| | | | | 25 | 9.5 | 0.0 | 9.5 |
| | | | | 50 | 11.6 | 1.3 | 12.9 |
| | | | | 120 | 18.0 | 7.7 | 25.6 |
| | | | | 175 | 0.7 | 2.9 | 3.6 |
| | | | | 250 | 0.8 | 4.7 | 5.5 |
| | | | | 500 | 1.1 | 9.9 | 11.0 |
| | | | | 750 | 0.3 | 2.4 | 2.6 |
| | | | | >750 | 0.3 | 2.4 | 2.6 |
| | | | Pressure Washers | 15 | 0.6 | 0.0 | 0.6 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.3 | 0.0 | 0.3 |
| | | | | 120 | 0.1 | 0.0 | 0.2 |
| | | | Pumps | 15 | 9.8 | 0.0 | 9.8 |
| | | | | 25 | 2.9 | 0.0 | 2.9 |
| | | | | 50 | 5.1 | 0.6 | 5.6 |
| | | | | 120 | 10.0 | 4.3 | 14.2 |
| | | | | 175 | 1.1 | 4.6 | 5.7 |
| | | | | 250 | 0.4 | 2.5 | 2.9 |
| | | | | 500 | 0.9 | 7.9 | 8.8 |
| | | | | >750 | 0.1 | 0.5 | 0.5 |
| | | | Welders | 15 | 4.4 | 0.0 | 4.4 |
| | | | | 25 | 3.9 | 0.0 | 3.9 |
| | | | | 50 | 11.9 | 1.3 | 13.3 |
| | | | | 120 | 9.3 | 4.0 | 13.2 |
| | | | | 175 | 0.0 | 0.2 | 0.2 |
| Modoc County APCD | Northeast Plateau | Modoc | Air Compressors | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.3 | 0.0 | 0.3 |
| | | | | 120 | 1.7 | 0.7 | 2.4 |
| | | | | 175 | 0.1 | 0.3 | 0.3 |
| | | | | 250 | 0.1 | 0.5 | 0.6 |
| | | | | 500 | 0.1 | 0.7 | 0.8 |
| | | | | 750 | 0.0 | 0.0 | 0.0 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Generator Sets | 15 | 1.4 | 0.0 | 1.4 |
| | | | | 25 | 1.0 | 0.0 | 1.0 |
| | | | | 50 | 1.2 | 0.1 | 1.4 |
| | | | | 120 | 1.9 | 0.8 | 2.7 |
| | | | | 175 | 0.1 | 0.3 | 0.4 |
| | | | | 250 | 0.1 | 0.5 | 0.6 |
| | | | | 500 | 0.1 | 1.0 | 1.2 |
| | | | | 750 | 0.0 | 0.3 | 0.3 |
| | | | | >750 | 0.0 | 0.3 | 0.3 |
| | | | Pressure Washers | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.0 | 0.0 | 0.0 |
| | | | | 120 | 0.0 | 0.0 | 0.0 |
| | | | Pumps | 15 | 1.0 | 0.0 | 1.0 |
| | | | | 25 | 0.3 | 0.0 | 0.3 |
| | | | | 50 | 0.5 | 0.1 | 0.6 |
| | | | | 120 | 1.1 | 0.5 | 1.5 |
| | | | | 175 | 0.1 | 0.5 | 0.6 |
| | | | | 250 | 0.0 | 0.3 | 0.3 |
| | | | | 500 | 0.1 | 0.8 | 0.9 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Welders | 15 | 0.5 | 0.0 | 0.5 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 1.3 | 0.1 | 1.4 |
| | | | | 120 | 1.0 | 0.4 | 1.4 |
| | | | | 175 | 0.0 | 0.0 | 0.0 |
| Mojave Desert AQMD | Mojave Desert | Riverside | Air Compressors | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.5 | 0.1 | 0.5 |
| | | | | 120 | 3.2 | 1.4 | 4.6 |
| | | | | 175 | 0.1 | 0.5 | 0.6 |
| | | | | 250 | 0.2 | 1.0 | 1.2 |
| | | | | 500 | 0.2 | 1.4 | 1.5 |
| | | | | 750 | 0.0 | 0.1 | 0.1 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 2.6 | 0.0 | 2.6 |
| | | | | 25 | 1.9 | 0.0 | 1.9 |
| | | | | 50 | 2.4 | 0.3 | 2.6 |
| | | | | 120 | 3.6 | 1.6 | 5.2 |
| | | | | 175 | 0.1 | 0.6 | 0.7 |
| | | | | 250 | 0.2 | 1.0 | 1.1 |
| | | | | 500 | 0.2 | 2.0 | 2.2 |
| | | | | 750 | 0.1 | 0.5 | 0.5 |
| | | | | >750 | 0.1 | 0.5 | 0.5 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Pressure Washers | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.1 | 0.0 | 0.1 |
| | | | | 120 | 0.0 | 0.0 | 0.0 |
| | | | Pumps | 15 | 2.0 | 0.0 | 2.0 |
| | | | | 25 | 0.6 | 0.0 | 0.6 |
| | | | | 50 | 1.0 | 0.1 | 1.1 |
| | | | | 120 | 2.0 | 0.9 | 2.9 |
| | | | | 175 | 0.2 | 0.9 | 1.2 |
| | | | | 250 | 0.1 | 0.5 | 0.6 |
| | | | | 500 | 0.2 | 1.6 | 1.8 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Welders | 15 | 0.9 | 0.0 | 0.9 |
| | | | | 25 | 0.8 | 0.0 | 0.8 |
| | | | | 50 | 2.4 | 0.3 | 2.7 |
| | | | | 120 | 1.9 | 0.8 | 2.7 |
| | | | | 175 | 0.0 | 0.0 | 0.0 |
| | | San Bernardino | Air Compressors | 15 | 0.6 | 0.0 | 0.6 |
| | | | | 25 | 1.2 | 0.0 | 1.2 |
| | | | | 50 | 10.9 | 1.2 | 12.1 |
| | | | | 120 | 73.2 | 31.3 | 104.. |
| | | | | 175 | 2.9 | 11.5 | 14.3 |
| | | | | 250 | 3.9 | 22.3 | 26.3 |
| | | | | 500 | 3.5 | 31.3 | 34.8 |
| | | | | 750 | 0.1 | 1.3 | 1.4 |
| | | | | >750 | 0.0 | 0.4 | 0.4 |
| | | | Generator Sets | 15 | 59.5 | 0.0 | 59.5 |
| | | | | 25 | 43.5 | 0.0 | 43.5 |
| | | | | 50 | 53.2 | 5.9 | 59.1 |
| | | | | 120 | 82.3 | 35.2 | 117.5 |
| | | | | 175 | 3.3 | 13.3 | 16.6 |
| | | | | 250 | 3.8 | 21.5 | 25.3 |
| | | | | 500 | 5.0 | 45.3 | 50.4 |
| | | | | 750 | 1.2 | 10.8 | 12.0 |
| | | | | >750 | 1.2 | 10.8 | 12.0 |
| | | | Pressure Washers | 15 | 2.8 | 0.0 | 2.8 |
| | | | | 25 | 0.6 | 0.0 | 0.6 |
| | | | | 50 | 1.3 | 0.1 | 1.4 |
| | | | | 120 | 0.5 | 0.2 | 0.7 |
| | | | Pumps | 15 | 44.7 | 0.0 | 44.7 |
| | | | | 25 | 13.3 | 0.0 | 13.3 |
| | | | | 50 | 23.3 | 2.5 | 25.8 |
| | | | | 120 | 45.7 | 19.6 | 65.2 |
| | | | | 175 | 5.2 | 20.9 | 26.2 |
| | | | | 250 | 2.0 | 11.4 | 13.4 |

# Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 500 | 4.0 | 36.3 | 40.3 |
| | | | | >750 | 0.3 | 2.3 | 2.5 |
| | | | Welders | 15 | 20.2 | 0.0 | 20.2 |
| | | | | 25 | 17.8 | 0.0 | 17.8 |
| | | | | 50 | 54.7 | 6.1 | 60.8 |
| | | | | 120 | 42.5 | 18.2 | 60.7 |
| | | | | 175 | 0.2 | 0.8 | 1.0 |
| Monterey Bay Unified APCD | North Central Coast | Monterey | Air Compressors | 15 | 0.6 | 0.0 | 0.6 |
| | | | | 25 | 1.3 | 0.0 | 1.3 |
| | | | | 50 | 11.2 | 1.2 | 12.4 |
| | | | | 120 | 74.9 | 32.1 | 106.9 |
| | | | | 175 | 2.9 | 11.7 | 14.7 |
| | | | | 250 | 4.0 | 22.9 | 26.9 |
| | | | | 500 | 3.6 | 32.0 | 35.6 |
| | | | | 750 | 0.1 | 1.3 | 1.5 |
| | | | | >750 | 0.0 | 0.4 | 0.4 |
| | | | Generator Sets | 15 | 60.9 | 0.0 | 60.9 |
| | | | | 25 | 44.5 | 0.0 | 44.5 |
| | | | | 50 | 54.4 | 6.1 | 60.5 |
| | | | | 120 | 84.2 | 36.0 | 120.2 |
| | | | | 175 | 3.4 | 13.6 | 17.0 |
| | | | | 250 | 3.9 | 22.0 | 25.9 |
| | | | | 500 | 5.2 | 46.4 | 51.5 |
| | | | | 750 | 1.2 | 11.1 | 12.3 |
| | | | | >750 | 1.2 | 11.1 | 12.3 |
| | | | Pressure Washers | 15 | 2.8 | 0.0 | 2.8 |
| | | | | 25 | 0.7 | 0.0 | 0.7 |
| | | | | 50 | 1.3 | 0.1 | 1.4 |
| | | | | 120 | 0.5 | 0.2 | 0.7 |
| | | | Pumps | 15 | 45.7 | 0.0 | 45.7 |
| | | | | 25 | 13.7 | 0.0 | 13.7 |
| | | | | 50 | 23.8 | 2.6 | 26.4 |
| | | | | 120 | 46.7 | 20.1 | 66.8 |
| | | | | 175 | 5.4 | 21.4 | 26.8 |
| | | | | 250 | 2.1 | 11.7 | 13.8 |
| | | | | 500 | 4.1 | 37.1 | 41.3 |
| | | | | >750 | 0.3 | 2.3 | 2.6 |
| | | | Welders | 15 | 20.7 | 0.0 | 20.7 |
| | | | | 25 | 18.2 | 0.0 | 18.2 |
| | | | | 50 | 56.0 | 6.2 | 62.2 |
| | | | | 120 | 43.5 | 18.6 | 62.1 |
| | | | | 175 | 0.2 | 0.8 | 1.0 |
| | | San Benito | Air Compressors | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 1.5 | 0.2 | 1.7 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 120 | 10.2 | 4.4 | 14.5 |
| | | | | 175 | 0.4 | 1.6 | 2.0 |
| | | | | 250 | 0.5 | 3.1 | 3.7 |
| | | | | 500 | 0.5 | 4.4 | 4.8 |
| | | | | 750 | 0.0 | 0.2 | 0.2 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Generator Sets | 15 | 8.3 | 0.0 | 8.3 |
| | | | | 25 | 6.1 | 0.0 | 6.1 |
| | | | | 50 | 7.4 | 0.8 | 8.2 |
| | | | | 120 | 11.4 | 4.9 | 16.3 |
| | | | | 175 | 0.5 | 1.8 | 2.3 |
| | | | | 250 | 0.5 | 3.0 | 3.5 |
| | | | | 500 | 0.7 | 6.3 | 7.0 |
| | | | | 750 | 0.2 | 1.5 | 1.7 |
| | | | | >750 | 0.2 | 1.5 | 1.7 |
| | | | Pressure Washers | 15 | 0.4 | 0.0 | 0.4 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.2 | 0.0 | 0.2 |
| | | | | 120 | 0.1 | 0.0 | 0.1 |
| | | | Pumps | 15 | 6.2 | 0.0 | 6.2 |
| | | | | 25 | 1.9 | 0.0 | 1.9 |
| | | | | 50 | 3.2 | 0.4 | 3.6 |
| | | | | 120 | 6.3 | 2.7 | 9.1 |
| | | | | 175 | 0.7 | 2.9 | 3.6 |
| | | | | 250 | 0.3 | 1.6 | 1.9 |
| | | | | 500 | 0.6 | 5.0 | 5.6 |
| | | | | >750 | 0.0 | 0.3 | 0.3 |
| | | | Welders | 15 | 2.8 | 0.0 | 2.8 |
| | | | | 25 | 2.5 | 0.0 | 2.5 |
| | | | | 50 | 7.6 | 0.8 | 8.5 |
| | | | | 120 | 5.9 | 2.5 | 8.4 |
| | | | | 175 | 0.0 | 0.1 | 0.1 |
| | | Santa Cruz | Air Compressors | 15 | 0.4 | 0.0 | 0.4 |
| | | | | 25 | 0.8 | 0.0 | 0.8 |
| | | | | 50 | 7.0 | 0.8 | 7.8 |
| | | | | 120 | 47.1 | 20.2 | 67.2 |
| | | | | 175 | 1.8 | 7.4 | 9.2 |
| | | | | 250 | 2.5 | 14.4 | 16.9 |
| | | | | 500 | 2.2 | 20.1 | 22.4 |
| | | | | 750 | 0.1 | 0.8 | 0.9 |
| | | | | >750 | 0.0 | 0.2 | 0.3 |
| | | | Generator Sets | 15 | 38.3 | 0.0 | 38.3 |
| | | | | 25 | 28.0 | 0.0 | 28.0 |
| | | | | 50 | 34.2 | 3.8 | 38.0 |
| | | | | 120 | 52.9 | 22.7 | 75.6 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 175 | 2.1 | 8.5 | 10.7 |
| | | | | 250 | 2.4 | 13.9 | 16.3 |
| | | | | 500 | 3.2 | 29.2 | 32.4 |
| | | | | 750 | 0.8 | 7.0 | 7.7 |
| | | | | >750 | 0.8 | 7.0 | 7.7 |
| | | | Pressure Washers | 15 | 1.8 | 0.0 | 1.8 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 0.8 | 0.1 | 0.9 |
| | | | | 120 | 0.3 | 0.1 | 0.5 |
| | | | Pumps | 15 | 28.7 | 0.0 | 28.7 |
| | | | | 25 | 8.6 | 0.0 | 8.6 |
| | | | | 50 | 15.0 | 1.6 | 16.6 |
| | | | | 120 | 29.4 | 12.6 | 42.0 |
| | | | | 175 | 3.4 | 13.5 | 16.8 |
| | | | | 250 | 1.3 | 7.4 | 8.6 |
| | | | | 500 | 2.6 | 23.4 | 25.9 |
| | | | | >750 | 0.2 | 1.5 | 1.6 |
| | | | Welders | 15 | 13.0 | 0.0 | 13.0 |
| | | | | 25 | 11.4 | 0.0 | 11.4 |
| | | | | 50 | 35.2 | 3.9 | 39.1 |
| | | | | 120 | 27.3 | 11.7 | 39.0 |
| | | | | 175 | 0.1 | 0.5 | 0.6 |
| North Coast Unified APCD | North Coast | Del Norte | Air Compressors | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.8 | 0.1 | 0.8 |
| | | | | 120 | 5.1 | 2.2 | 7.2 |
| | | | | 175 | 0.2 | 0.8 | 1.0 |
| | | | | 250 | 0.3 | 1.5 | 1.8 |
| | | | | 500 | 0.2 | 2.2 | 2.4 |
| | | | | 750 | 0.0 | 0.1 | 0.1 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 4.1 | 0.0 | 4.1 |
| | | | | 25 | 3.0 | 0.0 | 3.0 |
| | | | | 50 | 3.7 | 0.4 | 4.1 |
| | | | | 120 | 5.7 | 2.4 | 8.1 |
| | | | | 175 | 0.2 | 0.9 | 1.1 |
| | | | | 250 | 0.3 | 1.5 | 1.8 |
| | | | | 500 | 0.3 | 3.1 | 3.5 |
| | | | | 750 | 0.1 | 0.8 | 0.8 |
| | | | | >750 | 0.1 | 0.8 | 0.8 |
| | | | Pressure Washers | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.1 | 0.0 | 0.1 |
| | | | | 120 | 0.0 | 0.0 | 0.0 |
| | | | Pumps | 15 | 3.1 | 0.0 | 3.1 |

# Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 25 | 0.9 | 0.0 | 0.9 |
| | | | | 50 | 1.6 | 0.2 | 1.8 |
| | | | | 120 | 3.2 | 1.4 | 4.5 |
| | | | | 175 | 0.4 | 1.4 | 1.8 |
| | | | | 250 | 0.1 | 0.8 | 0.9 |
| | | | | 500 | 0.3 | 2.5 | 2.8 |
| | | | | >750 | 0.0 | 0.2 | 0.2 |
| | | | Welders | 15 | 1.4 | 0.0 | 1.4 |
| | | | | 25 | 1.2 | 0.0 | 1.2 |
| | | | | 50 | 3.8 | 0.4 | 4.2 |
| | | | | 120 | 2.9 | 1.3 | 4.2 |
| | | | | 175 | 0.0 | 0.1 | 0.1 |
| | | Humboldt | Air Compressors | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 3.5 | 0.4 | 3.8 |
| | | | | 120 | 23.2 | 9.9 | 33.1 |
| | | | | 175 | 0.9 | 3.6 | 4.5 |
| | | | | 250 | 1.2 | 7.1 | 8.3 |
| | | | | 500 | 1.1 | 9.9 | 11.0 |
| | | | | 750 | 0.0 | 0.4 | 0.5 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Generator Sets | 15 | 18.8 | 0.0 | 18.8 |
| | | | | 25 | 13.8 | 0.0 | 13.8 |
| | | | | 50 | 16.8 | 1.9 | 18.7 |
| | | | | 120 | 26.0 | 11.2 | 37.2 |
| | | | | 175 | 1.1 | 4.2 | 5.3 |
| | | | | 250 | 1.2 | 6.8 | 8.0 |
| | | | | 500 | 1.6 | 14.4 | 16.0 |
| | | | | 750 | 0.4 | 3.4 | 3.8 |
| | | | | >750 | 0.4 | 3.4 | 3.8 |
| | | | Pressure Washers | 15 | 0.9 | 0.0 | 0.9 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 0.4 | 0.0 | 0.4 |
| | | | | 120 | 0.2 | 0.1 | 0.2 |
| | | | Pumps | 15 | 14.1 | 0.0 | 14.1 |
| | | | | 25 | 4.2 | 0.0 | 4.2 |
| | | | | 50 | 7.4 | 0.8 | 8.2 |
| | | | | 120 | 14.5 | 6.2 | 20.7 |
| | | | | 175 | 1.7 | 6.6 | 8.3 |
| | | | | 250 | 0.6 | 3.6 | 4.3 |
| | | | | 500 | 1.3 | 11.5 | 12.8 |
| | | | | >750 | 0.1 | 0.7 | 0.8 |
| | | | Welders | 15 | 6.4 | 0.0 | 6.4 |
| | | | | 25 | 5.6 | 0.0 | 5.6 |
| | | | | 50 | 17.3 | 1.9 | 19.3 |
| | | | | 120 | 13.5 | 5.8 | 19.2 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 175 | 0.1 | 0.2 | 0.3 |
| | | Trinity | Air Compressors | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.4 | 0.0 | 0.4 |
| | | | | 120 | 2.4 | 1.0 | 3.4 |
| | | | | 175 | 0.1 | 0.4 | 0.5 |
| | | | | 250 | 0.1 | 0.7 | 0.9 |
| | | | | 500 | 0.1 | 1.0 | 1.1 |
| | | | | 750 | 0.0 | 0.0 | 0.0 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 1.9 | 0.0 | 1.9 |
| | | | | 25 | 1.4 | 0.0 | 1.4 |
| | | | | 50 | 1.7 | 0.2 | 1.9 |
| | | | | 120 | 2.7 | 1.1 | 3.8 |
| | | | | 175 | 0.1 | 0.4 | 0.5 |
| | | | | 250 | 0.1 | 0.7 | 0.8 |
| | | | | 500 | 0.2 | 1.5 | 1.6 |
| | | | | 750 | 0.0 | 0.4 | 0.4 |
| | | | | >750 | 0.0 | 0.4 | 0.4 |
| | | | Pressure Washers | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.0 | 0.0 | 0.0 |
| | | | | 120 | 0.0 | 0.0 | 0.0 |
| | | | Pumps | 15 | 1.5 | 0.0 | 1.5 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 0.8 | 0.1 | 0.8 |
| | | | | 120 | 1.5 | 0.6 | 2.1 |
| | | | | 175 | 0.2 | 0.7 | 0.9 |
| | | | | 250 | 0.1 | 0.4 | 0.4 |
| | | | | 500 | 0.1 | 1.2 | 1.3 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Welders | 15 | 0.7 | 0.0 | 0.7 |
| | | | | 25 | 0.6 | 0.0 | 0.6 |
| | | | | 50 | 1.8 | 0.2 | 2.0 |
| | | | | 120 | 1.4 | 0.6 | 2.0 |
| | | | | 175 | 0.0 | 0.0 | 0.0 |
| Northern Sierra AQMD | Mountain Counties | Nevada | Air Compressors | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.3 | 0.0 | 0.3 |
| | | | | 50 | 2.6 | 0.3 | 2.9 |
| | | | | 120 | 17.4 | 7.4 | 24.8 |
| | | | | 175 | 0.7 | 2.7 | 3.4 |
| | | | | 250 | 0.9 | 5.3 | 6.2 |
| | | | | 500 | 0.8 | 7.4 | 8.3 |
| | | | | 750 | 0.0 | 0.3 | 0.3 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Generator Sets | 15 | 14.1 | 0.0 | 14.1 |
| | | | | 25 | 10.3 | 0.0 | 10.3 |
| | | | | 50 | 12.6 | 1.4 | 14.0 |
| | | | | 120 | 19.5 | 8.4 | 27.9 |
| | | | | 175 | 0.8 | 3.2 | 3.9 |
| | | | | 250 | 0.9 | 5.1 | 6.0 |
| | | | | 500 | 1.2 | 10.8 | 12.0 |
| | | | | 750 | 0.3 | 2.6 | 2.9 |
| | | | | >750 | 0.3 | 2.6 | 2.9 |
| | | | Pressure Washers | 15 | 0.7 | 0.0 | 0.7 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 0.3 | 0.0 | 0.3 |
| | | | | 120 | 0.1 | 0.0 | 0.2 |
| | | | Pumps | 15 | 10.6 | 0.0 | 10.6 |
| | | | | 25 | 3.2 | 0.0 | 3.2 |
| | | | | 50 | 5.5 | 0.6 | 6.1 |
| | | | | 120 | 10.8 | 4.7 | 15.5 |
| | | | | 175 | 1.2 | 5.0 | 6.2 |
| | | | | 250 | 0.5 | 2.7 | 3.2 |
| | | | | 500 | 1.0 | 8.6 | 9.6 |
| | | | | >750 | 0.1 | 0.5 | 0.[illegible] |
| | | | Welders | 15 | 4.8 | 0.0 | 4.8 |
| | | | | 25 | 4.2 | 0.0 | 4.2 |
| | | | | 50 | 13.0 | 1.5 | 14.5 |
| | | | | 120 | 10.1 | 4.3 | 14.4 |
| | | | | 175 | 0.0 | 0.2 | 0.2 |
| | | Plumas | Air Compressors | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.6 | 0.1 | 0.6 |
| | | | | 120 | 3.8 | 1.6 | 5.4 |
| | | | | 175 | 0.1 | 0.6 | 0.7 |
| | | | | 250 | 0.2 | 1.2 | 1.4 |
| | | | | 500 | 0.2 | 1.6 | 1.8 |
| | | | | 750 | 0.0 | 0.1 | 0.1 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 3.1 | 0.0 | 3.1 |
| | | | | 25 | 2.3 | 0.0 | 2.3 |
| | | | | 50 | 2.8 | 0.3 | 3.1 |
| | | | | 120 | 4.3 | 1.8 | 6.1 |
| | | | | 175 | 0.2 | 0.7 | 0.9 |
| | | | | 250 | 0.2 | 1.1 | 1.3 |
| | | | | 500 | 0.3 | 2.4 | 2.6 |
| | | | | 750 | 0.1 | 0.6 | 0.[illegible] |
| | | | | >750 | 0.1 | 0.6 | 0.[illegible] |

| Attachment F<br>2002 OFFROAD-PSR Stationary Diesel Population | | | | | | | |
|---|---|---|---|---|---|---|---|
| Location | | | Equipment | | | | |
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Pressure Washers | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.1 | 0.0 | 0.1 |
| | | | | 120 | 0.0 | 0.0 | 0.0 |
| | | | Pumps | 15 | 2.3 | 0.0 | 2.3 |
| | | | | 25 | 0.7 | 0.0 | 0.7 |
| | | | | 50 | 1.2 | 0.1 | 1.3 |
| | | | | 120 | 2.4 | 1.0 | 3.4 |
| | | | | 175 | 0.3 | 1.1 | 1.4 |
| | | | | 250 | 0.1 | 0.6 | 0.7 |
| | | | | 500 | 0.2 | 1.9 | 2.1 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Welders | 15 | 1.1 | 0.0 | 1.1 |
| | | | | 25 | 0.9 | 0.0 | 0.9 |
| | | | | 50 | 2.8 | 0.3 | 3.2 |
| | | | | 120 | 2.2 | 0.9 | 3.2 |
| | | | | 175 | 0.0 | 0.0 | 0.1 |
| | | Sierra | Air Compressors | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.1 | 0.0 | 0.1 |
| | | | | 120 | 0.6 | 0.3 | 0.9 |
| | | | | 175 | 0.0 | 0.1 | 0.1 |
| | | | | 250 | 0.0 | 0.2 | 0.2 |
| | | | | 500 | 0.0 | 0.3 | 0.3 |
| | | | | 750 | 0.0 | 0.0 | 0.0 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 0.5 | 0.0 | 0.5 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 0.5 | 0.1 | 0.5 |
| | | | | 120 | 0.7 | 0.3 | 1.0 |
| | | | | 175 | 0.0 | 0.1 | 0.1 |
| | | | | 250 | 0.0 | 0.2 | 0.2 |
| | | | | 500 | 0.0 | 0.4 | 0.4 |
| | | | | 750 | 0.0 | 0.1 | 0.1 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Pressure Washers | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.0 | 0.0 | 0.0 |
| | | | | 120 | 0.0 | 0.0 | 0.0 |
| | | | Pumps | 15 | 0.4 | 0.0 | 0.4 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.2 | 0.0 | 0.2 |
| | | | | 120 | 0.4 | 0.2 | 0.6 |
| | | | | 175 | 0.0 | 0.2 | 0.2 |
| | | | | 250 | 0.0 | 0.1 | 0.1 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 500 | 0.0 | 0.3 | 0.4 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Welders | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 0.5 | 0.1 | 0.5 |
| | | | | 120 | 0.4 | 0.2 | 0.5 |
| | | | | 175 | 0.0 | 0.0 | 0.0 |
| Northern Sonoma County APCD | North Coast | Sonoma | Air Compressors | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 1.6 | 0.2 | 1.8 |
| | | | | 120 | 10.6 | 4.5 | 15.1 |
| | | | | 175 | 0.4 | 1.7 | 2.1 |
| | | | | 250 | 0.6 | 3.2 | 3.8 |
| | | | | 500 | 0.5 | 4.5 | 5.0 |
| | | | | 750 | 0.0 | 0.2 | 0.2 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Generator Sets | 15 | 8.6 | 0.0 | 8.6 |
| | | | | 25 | 6.3 | 0.0 | 6.3 |
| | | | | 50 | 7.7 | 0.9 | 8.5 |
| | | | | 120 | 11.9 | 5.1 | 17.0 |
| | | | | 175 | 0.5 | 1.9 | 2.[illegible] |
| | | | | 250 | 0.5 | 3.1 | 3.7 |
| | | | | 500 | 0.7 | 6.6 | 7.3 |
| | | | | 750 | 0.2 | 1.6 | 1.7 |
| | | | | >750 | 0.2 | 1.6 | 1.7 |
| | | | Pressure Washers | 15 | 0.4 | 0.0 | 0.4 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.2 | 0.0 | 0.2 |
| | | | | 120 | 0.1 | 0.0 | 0.1 |
| | | | Pumps | 15 | 6.5 | 0.0 | 6.5 |
| | | | | 25 | 1.9 | 0.0 | 1.9 |
| | | | | 50 | 3.4 | 0.4 | 3.7 |
| | | | | 120 | 6.6 | 2.8 | 9.4 |
| | | | | 175 | 0.8 | 3.0 | 3.8 |
| | | | | 250 | 0.3 | 1.7 | 1.9 |
| | | | | 500 | 0.6 | 5.2 | 5.8 |
| | | | | >750 | 0.0 | 0.3 | 0.4 |
| | | | Welders | 15 | 2.9 | 0.0 | 2.9 |
| | | | | 25 | 2.6 | 0.0 | 2.6 |
| | | | | 50 | 7.9 | 0.9 | 8.8 |
| | | | | 120 | 6.1 | 2.6 | 8.8 |
| | | | | 175 | 0.0 | 0.1 | 0.1 |
| Placer County APCD | Lake Tahoe | Placer | Air Compressors | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.0 | 0.0 | 0.[illegible] |
| | | | | 50 | 0.4 | 0.0 | 0.4 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 120 | 2.4 | 1.0 | 3.4 |
| | | | | 175 | 0.1 | 0.4 | 0.5 |
| | | | | 250 | 0.1 | 0.7 | 0.9 |
| | | | | 500 | 0.1 | 1.0 | 1.1 |
| | | | | 750 | 0.0 | 0.0 | 0.0 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 1.9 | 0.0 | 1.9 |
| | | | | 25 | 1.4 | 0.0 | 1.4 |
| | | | | 50 | 1.7 | 0.2 | 1.9 |
| | | | | 120 | 2.7 | 1.2 | 3.9 |
| | | | | 175 | 0.1 | 0.4 | 0.5 |
| | | | | 250 | 0.1 | 0.7 | 0.8 |
| | | | | 500 | 0.2 | 1.5 | 1.7 |
| | | | | 750 | 0.0 | 0.4 | 0.4 |
| | | | | >750 | 0.0 | 0.4 | 0.4 |
| | | | Pressure Washers | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.0 | 0.0 | 0.0 |
| | | | | 120 | 0.0 | 0.0 | 0.0 |
| | | | Pumps | 15 | 1.5 | 0.0 | 1.5 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 0.8 | 0.1 | 0.8 |
| | | | | 120 | 1.5 | 0.6 | 2.1 |
| | | | | 175 | 0.2 | 0.7 | 0.9 |
| | | | | 250 | 0.1 | 0.4 | 0.4 |
| | | | | 500 | 0.1 | 1.2 | 1.3 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Welders | 15 | 0.7 | 0.0 | 0.7 |
| | | | | 25 | 0.6 | 0.0 | 0.6 |
| | | | | 50 | 1.8 | 0.2 | 2.0 |
| | | | | 120 | 1.4 | 0.6 | 2.0 |
| | | | | 175 | 0.0 | 0.0 | 0.0 |
| | Mountain Counties | | Air Compressors | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.7 | 0.1 | 0.7 |
| | | | | 120 | 4.4 | 1.9 | 6.3 |
| | | | | 175 | 0.2 | 0.7 | 0.9 |
| | | | | 250 | 0.2 | 1.3 | 1.6 |
| | | | | 500 | 0.2 | 1.9 | 2.1 |
| | | | | 750 | 0.0 | 0.1 | 0.1 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 3.6 | 0.0 | 3.6 |
| | | | | 25 | 2.6 | 0.0 | 2.6 |
| | | | | 50 | 3.2 | 0.4 | 3.5 |
| | | | | 120 | 4.9 | 2.1 | 7.0 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 175 | 0.2 | 0.8 | 1.0 |
| | | | | 250 | 0.2 | 1.3 | 1.5 |
| | | | | 500 | 0.3 | 2.7 | 3.0 |
| | | | | 750 | 0.1 | 0.6 | 0.7 |
| | | | | >750 | 0.1 | 0.6 | 0.7 |
| | | | Pressure Washers | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.1 | 0.0 | 0.1 |
| | | | | 120 | 0.0 | 0.0 | 0.0 |
| | | | Pumps | 15 | 2.7 | 0.0 | 2.7 |
| | | | | 25 | 0.8 | 0.0 | 0.8 |
| | | | | 50 | 1.4 | 0.2 | 1.5 |
| | | | | 120 | 2.7 | 1.2 | 3.9 |
| | | | | 175 | 0.3 | 1.3 | 1.6 |
| | | | | 250 | 0.1 | 0.7 | 0.8 |
| | | | | 500 | 0.2 | 2.2 | 2.4 |
| | | | | >750 | 0.0 | 0.1 | 0.2 |
| | | | Welders | 15 | 1.2 | 0.0 | 1.2 |
| | | | | 25 | 1.1 | 0.0 | 1.1 |
| | | | | 50 | 3.3 | 0.4 | 3.6 |
| | | | | 120 | 2.5 | 1.1 | 3.6 |
| | | | | 175 | 0.0 | 0.0 | 0.1 |
| | Sacramento Valley | | Air Compressors | 15 | 0.4 | 0.0 | 0.4 |
| | | | | 25 | 0.7 | 0.0 | 0.7 |
| | | | | 50 | 6.3 | 0.7 | 7.0 |
| | | | | 120 | 42.4 | 18.2 | 60.6 |
| | | | | 175 | 1.7 | 6.6 | 8.3 |
| | | | | 250 | 2.3 | 13.0 | 15.2 |
| | | | | 500 | 2.0 | 18.1 | 20.2 |
| | | | | 750 | 0.1 | 0.7 | 0.8 |
| | | | | >750 | 0.0 | 0.2 | 0.2 |
| | | | Generator Sets | 15 | 34.5 | 0.0 | 34.5 |
| | | | | 25 | 25.2 | 0.0 | 25.2 |
| | | | | 50 | 30.8 | 3.4 | 34.3 |
| | | | | 120 | 47.7 | 20.4 | 68.1 |
| | | | | 175 | 1.9 | 7.7 | 9.6 |
| | | | | 250 | 2.2 | 12.5 | 14.7 |
| | | | | 500 | 2.9 | 26.3 | 29.2 |
| | | | | 750 | 0.7 | 6.3 | 7.0 |
| | | | | >750 | 0.7 | 6.3 | 7.0 |
| | | | Pressure Washers | 15 | 1.6 | 0.0 | 1.6 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 0.7 | 0.1 | 0.8 |
| | | | | 120 | 0.3 | 0.1 | 0.4 |
| | | | Pumps | 15 | 25.9 | 0.0 | 25.9 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 25 | 7.7 | 0.0 | 7.7 |
| | | | | 50 | 13.5 | 1.5 | 14.9 |
| | | | | 120 | 26.5 | 11.4 | 37.8 |
| | | | | 175 | 3.0 | 12.1 | 15.2 |
| | | | | 250 | 1.2 | 6.6 | 7.8 |
| | | | | 500 | 2.3 | 21.0 | 23.4 |
| | | | | >750 | 0.1 | 1.3 | 1.5 |
| | | | Welders | 15 | 11.7 | 0.0 | 11.7 |
| | | | | 25 | 10.3 | 0.0 | 10.3 |
| | | | | 50 | 31.7 | 3.5 | 35.2 |
| | | | | 120 | 24.6 | 10.5 | 35.2 |
| | | | | 175 | 0.1 | 0.4 | 0.6 |
| Sacramento Metropolitan AQMD | | Sacramento | Air Compressors | 15 | 2.0 | 0.0 | 2.0 |
| | | | | 25 | 4.0 | 0.0 | 4.0 |
| | | | | 50 | 35.3 | 3.8 | 39.1 |
| | | | | 120 | 235.7 | 101.0 | 336.8 |
| | | | | 175 | 9.2 | 36.9 | 46.2 |
| | | | | 250 | 12.7 | 72.0 | 84.7 |
| | | | | 500 | 11.2 | 100.9 | 112.1 |
| | | | | 750 | 0.5 | 4.1 | 4.6 |
| | | | | >750 | 0.2 | 1.2 | 1.3 |
| | | | Generator Sets | 15 | 191.7 | 0.0 | 191.7 |
| | | | | 25 | 140.2 | 0.0 | 140.2 |
| | | | | 50 | 171.4 | 19.1 | 190.5 |
| | | | | 120 | 265.1 | 113.5 | 378.6 |
| | | | | 175 | 10.7 | 42.7 | 53.4 |
| | | | | 250 | 12.2 | 69.4 | 81.6 |
| | | | | 500 | 16.2 | 146.1 | 162.4 |
| | | | | 750 | 3.9 | 35.0 | 38.8 |
| | | | | >750 | 3.9 | 35.0 | 38.8 |
| | | | Pressure Washers | 15 | 8.9 | 0.0 | 8.9 |
| | | | | 25 | 2.1 | 0.0 | 2.1 |
| | | | | 50 | 4.1 | 0.3 | 4.4 |
| | | | | 120 | 1.7 | 0.6 | 2.3 |
| | | | Pumps | 15 | 143.9 | 0.0 | 143.9 |
| | | | | 25 | 43.0 | 0.0 | 43.0 |
| | | | | 50 | 74.9 | 8.2 | 83.1 |
| | | | | 120 | 147.1 | 63.1 | 210.2 |
| | | | | 175 | 16.9 | 67.5 | 84.3 |
| | | | | 250 | 6.5 | 36.8 | 43.3 |
| | | | | 500 | 13.0 | 117.0 | 130.0 |
| | | | | >750 | 0.8 | 7.3 | 8.1 |
| | | | Welders | 15 | 65.1 | 0.0 | 65.1 |
| | | | | 25 | 57.3 | 0.0 | 57.3 |
| | | | | 50 | 176.3 | 19.7 | 195.9 |
| | | | | 120 | 136.9 | 58.6 | 195.5 |

# Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 175 | 0.7 | 2.5 | 3.1 |
| San Diego County APCD | San Diego | San Diego | Air Compressors | 15 | 4.4 | 0.0 | 4.4 |
| | | | | 25 | 9.1 | 0.0 | 9.1 |
| | | | | 50 | 79.8 | 8.6 | 88.4 |
| | | | | 120 | 533.2 | 228.5 | 761.7 |
| | | | | 175 | 20.8 | 83.6 | 104.4 |
| | | | | 250 | 28.7 | 162.9 | 191.6 |
| | | | | 500 | 25.4 | 228.1 | 253.5 |
| | | | | 750 | 1.1 | 9.3 | 10.4 |
| | | | | >750 | 0.3 | 2.7 | 3.0 |
| | | | Generator Sets | 15 | 433.5 | 0.0 | 433.5 |
| | | | | 25 | 317.1 | 0.0 | 317.1 |
| | | | | 50 | 387.7 | 43.2 | 430.9 |
| | | | | 120 | 599.6 | 256.7 | 856.3 |
| | | | | 175 | 24.2 | 96.7 | 120.9 |
| | | | | 250 | 27.6 | 157.0 | 184.6 |
| | | | | 500 | 36.7 | 330.5 | 367.2 |
| | | | | 750 | 8.7 | 79.1 | 87.8 |
| | | | | >750 | 8.7 | 79.1 | 87.8 |
| | | | Pressure Washers | 15 | 20.1 | 0.0 | 20.1 |
| | | | | 25 | 4.7 | 0.0 | 4.7 |
| | | | | 50 | 9.3 | 0.7 | 9.9 |
| | | | | 120 | 3.8 | 1.3 | 5.1 |
| | | | Pumps | 15 | 325.6 | 0.0 | 325.6 |
| | | | | 25 | 97.3 | 0.0 | 97.3 |
| | | | | 50 | 169.5 | 18.5 | 188.0 |
| | | | | 120 | 332.7 | 142.8 | 475.6 |
| | | | | 175 | 38.2 | 152.6 | 190.7 |
| | | | | 250 | 14.7 | 83.3 | 98.0 |
| | | | | 500 | 29.4 | 264.6 | 294.1 |
| | | | | >750 | 1.9 | 16.5 | 18.3 |
| | | | Welders | 15 | 147.2 | 0.0 | 147.2 |
| | | | | 25 | 129.6 | 0.0 | 129.6 |
| | | | | 50 | 398.7 | 44.5 | 443.2 |
| | | | | 120 | 309.7 | 132.6 | 442.3 |
| | | | | 175 | 1.5 | 5.6 | 7.1 |
| San Joaquin Valley Unified APCD | San Joaquin Valley | Fresno | Air Compressors | 15 | 1.3 | 0.0 | 1.3 |
| | | | | 25 | 2.6 | 0.0 | 2.6 |
| | | | | 50 | 22.7 | 2.5 | 25.2 |
| | | | | 120 | 151.8 | 65.0 | 216.8 |
| | | | | 175 | 5.9 | 23.8 | 29.7 |
| | | | | 250 | 8.2 | 46.4 | 54.5 |
| | | | | 500 | 7.2 | 64.9 | 72.2 |
| | | | | 750 | 0.3 | 2.7 | 3.0 |
| | | | | >750 | 0.1 | 0.8 | 0.9 |

## Attachment F
## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Generator Sets | 15 | 123.4 | 0.0 | 123.4 |
| | | | | 25 | 90.3 | 0.0 | 90.3 |
| | | | | 50 | 110.3 | 12.3 | 122.6 |
| | | | | 120 | 170.7 | 73.1 | 243.7 |
| | | | | 175 | 6.9 | 27.5 | 34.4 |
| | | | | 250 | 7.9 | 44.7 | 52.5 |
| | | | | 500 | 10.5 | 94.1 | 104.5 |
| | | | | 750 | 2.5 | 22.5 | 25.0 |
| | | | | >750 | 2.5 | 22.5 | 25.0 |
| | | | Pressure Washers | 15 | 5.7 | 0.0 | 5.7 |
| | | | | 25 | 1.3 | 0.0 | 1.3 |
| | | | | 50 | 2.6 | 0.2 | 2.8 |
| | | | | 120 | 1.1 | 0.4 | 1.5 |
| | | | Pumps | 15 | 92.7 | 0.0 | 92.7 |
| | | | | 25 | 27.7 | 0.0 | 27.7 |
| | | | | 50 | 48.2 | 5.3 | 53.5 |
| | | | | 120 | 94.7 | 40.7 | 135.4 |
| | | | | 175 | 10.9 | 43.4 | 54.3 |
| | | | | 250 | 4.2 | 23.7 | 27.9 |
| | | | | 500 | 8.4 | 75.3 | 83.7 |
| | | | | >750 | 0.5 | 4.7 | 5.2 |
| | | | Welders | 15 | 41.9 | 0.0 | 41.9 |
| | | | | 25 | 36.9 | 0.0 | 36.9 |
| | | | | 50 | 113.5 | 12.7 | 126.1 |
| | | | | 120 | 88.1 | 37.7 | 125.9 |
| | | | | 175 | 0.4 | 1.6 | 2.0 |
| | | Kern | Air Compressors | 15 | 0.9 | 0.0 | 0.9 |
| | | | | 25 | 1.8 | 0.0 | 1.8 |
| | | | | 50 | 15.7 | 1.7 | 17.4 |
| | | | | 120 | 105.2 | 45.1 | 150.2 |
| | | | | 175 | 4.1 | 16.5 | 20.6 |
| | | | | 250 | 5.7 | 32.1 | 37.8 |
| | | | | 500 | 5.0 | 45.0 | 50.0 |
| | | | | 750 | 0.2 | 1.8 | 2.0 |
| | | | | >750 | 0.1 | 0.5 | 0.6 |
| | | | Generator Sets | 15 | 85.5 | 0.0 | 85.5 |
| | | | | 25 | 62.5 | 0.0 | 62.5 |
| | | | | 50 | 76.5 | 8.5 | 85.0 |
| | | | | 120 | 118.3 | 50.6 | 168.9 |
| | | | | 175 | 4.8 | 19.1 | 23.8 |
| | | | | 250 | 5.5 | 31.0 | 36.4 |
| | | | | 500 | 7.2 | 65.2 | 72.4 |
| | | | | 750 | 1.7 | 15.6 | 17.3 |
| | | | | >750 | 1.7 | 15.6 | 17.3 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Pressure Washers | 15 | 4.0 | 0.0 | 4.0 |
| | | | | 25 | 0.9 | 0.0 | 0.9 |
| | | | | 50 | 1.8 | 0.1 | 2.0 |
| | | | | 120 | 0.7 | 0.3 | 1.0 |
| | | | Pumps | 15 | 64.2 | 0.0 | 64.2 |
| | | | | 25 | 19.2 | 0.0 | 19.2 |
| | | | | 50 | 33.4 | 3.6 | 37.1 |
| | | | | 120 | 65.6 | 28.2 | 93.8 |
| | | | | 175 | 7.5 | 30.1 | 37.6 |
| | | | | 250 | 2.9 | 16.4 | 19.3 |
| | | | | 500 | 5.8 | 52.2 | 58.0 |
| | | | | >750 | 0.4 | 3.2 | 3.6 |
| | | | Welders | 15 | 29.0 | 0.0 | 29.0 |
| | | | | 25 | 25.6 | 0.0 | 25.6 |
| | | | | 50 | 78.6 | 8.8 | 87.4 |
| | | | | 120 | 61.1 | 26.2 | 87.2 |
| | | | | 175 | 0.3 | 1.1 | 1.4 |
| | | Kings | Air Compressors | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 3.7 | 0.4 | 4.1 |
| | | | | 120 | 24.5 | 10.5 | 35.0 |
| | | | | 175 | 1.0 | 3.8 | 4.8 |
| | | | | 250 | 1.3 | 7.5 | 8.8 |
| | | | | 500 | 1.2 | 10.5 | 11.6 |
| | | | | 750 | 0.0 | 0.4 | 0.5 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Generator Sets | 15 | 19.9 | 0.0 | 19.9 |
| | | | | 25 | 14.6 | 0.0 | 14.6 |
| | | | | 50 | 17.8 | 2.0 | 19.8 |
| | | | | 120 | 27.5 | 11.8 | 39.3 |
| | | | | 175 | 1.1 | 4.4 | 5.5 |
| | | | | 250 | 1.3 | 7.2 | 8.5 |
| | | | | 500 | 1.7 | 15.2 | 16.9 |
| | | | | 750 | 0.4 | 3.6 | 4.0 |
| | | | | >750 | 0.4 | 3.6 | 4.0 |
| | | | Pressure Washers | 15 | 0.9 | 0.0 | 0.9 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 0.4 | 0.0 | 0.5 |
| | | | | 120 | 0.2 | 0.1 | 0.2 |
| | | | Pumps | 15 | 14.9 | 0.0 | 14.9 |
| | | | | 25 | 4.5 | 0.0 | 4.5 |
| | | | | 50 | 7.8 | 0.8 | 8.6 |
| | | | | 120 | 15.3 | 6.6 | 21.9 |
| | | | | 175 | 1.8 | 7.0 | 8.8 |
| | | | | 250 | 0.7 | 3.8 | 4.5 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 500 | 1.3 | 12.1 | 13.5 |
| | | | | >750 | 0.1 | 0.8 | 0.8 |
| | | | Welders | 15 | 6.8 | 0.0 | 6.8 |
| | | | | 25 | 5.9 | 0.0 | 5.9 |
| | | | | 50 | 18.3 | 2.0 | 20.3 |
| | | | | 120 | 14.2 | 6.1 | 20.3 |
| | | | | 175 | 0.1 | 0.3 | 0.3 |
| | | Madera | Air Compressors | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 3.6 | 0.4 | 4.0 |
| | | | | 120 | 23.9 | 10.3 | 34.2 |
| | | | | 175 | 0.9 | 3.8 | 4.7 |
| | | | | 250 | 1.3 | 7.3 | 8.6 |
| | | | | 500 | 1.1 | 10.2 | 11.4 |
| | | | | 750 | 0.0 | 0.4 | 0.5 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Generator Sets | 15 | 19.5 | 0.0 | 19.5 |
| | | | | 25 | 14.2 | 0.0 | 14.2 |
| | | | | 50 | 17.4 | 1.9 | 19.3 |
| | | | | 120 | 26.9 | 11.5 | 38.5 |
| | | | | 175 | 1.1 | 4.3 | 5.4 |
| | | | | 250 | 1.2 | 7.0 | 8.3 |
| | | | | 500 | 1.7 | 14.8 | 16.5 |
| | | | | 750 | 0.4 | 3.6 | 3.9 |
| | | | | >750 | 0.4 | 3.6 | 3.9 |
| | | | Pressure Washers | 15 | 0.9 | 0.0 | 0.9 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 0.4 | 0.0 | 0.4 |
| | | | | 120 | 0.2 | 0.1 | 0.2 |
| | | | Pumps | 15 | 14.6 | 0.0 | 14.6 |
| | | | | 25 | 4.4 | 0.0 | 4.4 |
| | | | | 50 | 7.6 | 0.8 | 8.4 |
| | | | | 120 | 14.9 | 6.4 | 21.4 |
| | | | | 175 | 1.7 | 6.9 | 8.6 |
| | | | | 250 | 0.7 | 3.7 | 4.4 |
| | | | | 500 | 1.3 | 11.9 | 13.2 |
| | | | | >750 | 0.1 | 0.7 | 0.8 |
| | | | Welders | 15 | 6.6 | 0.0 | 6.6 |
| | | | | 25 | 5.8 | 0.0 | 5.8 |
| | | | | 50 | 17.9 | 2.0 | 19.9 |
| | | | | 120 | 13.9 | 6.0 | 19.9 |
| | | | | 175 | 0.1 | 0.3 | 0.3 |
| | | Merced | Air Compressors | 15 | 0.3 | 0.0 | 0.3 |
| | | | | 25 | 0.7 | 0.0 | 0.7 |
| | | | | 50 | 6.1 | 0.7 | 6.7 |

# Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 120 | 40.5 | 17.3 | 57.8 |
| | | | | 175 | 1.6 | 6.3 | 7.9 |
| | | | | 250 | 2.2 | 12.4 | 14.5 |
| | | | | 500 | 1.9 | 17.3 | 19.2 |
| | | | | 750 | 0.1 | 0.7 | 0.8 |
| | | | | >750 | 0.0 | 0.2 | 0.2 |
| | | | Generator Sets | 15 | 32.9 | 0.0 | 32.9 |
| | | | | 25 | 24.1 | 0.0 | 24.1 |
| | | | | 50 | 29.4 | 3.3 | 32.7 |
| | | | | 120 | 45.5 | 19.5 | 65.0 |
| | | | | 175 | 1.8 | 7.3 | 9.2 |
| | | | | 250 | 2.1 | 11.9 | 14.0 |
| | | | | 500 | 2.8 | 25.1 | 27.9 |
| | | | | 750 | 0.7 | 6.0 | 6.7 |
| | | | | >750 | 0.7 | 6.0 | 6.7 |
| | | | Pressure Washers | 15 | 1.5 | 0.0 | 1.5 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 0.7 | 0.1 | 0.8 |
| | | | | 120 | 0.3 | 0.1 | 0.4 |
| | | | Pumps | 15 | 24.7 | 0.0 | 24.7 |
| | | | | 25 | 7.4 | 0.0 | 7.4 |
| | | | | 50 | 12.9 | 1.4 | 14.3 |
| | | | | 120 | 25.2 | 10.8 | 36.1 |
| | | | | 175 | 2.9 | 11.6 | 14.5 |
| | | | | 250 | 1.1 | 6.3 | 7.4 |
| | | | | 500 | 2.2 | 20.1 | 22.3 |
| | | | | >750 | 0.1 | 1.2 | 1.4 |
| | | | Welders | 15 | 11.2 | 0.0 | 11.2 |
| | | | | 25 | 9.8 | 0.0 | 9.8 |
| | | | | 50 | 30.3 | 3.4 | 33.6 |
| | | | | 120 | 23.5 | 10.1 | 33.6 |
| | | | | 175 | 0.1 | 0.4 | 0.5 |
| | | San Joaquin | Air Compressors | 15 | 0.9 | 0.0 | 0.9 |
| | | | | 25 | 1.9 | 0.0 | 1.9 |
| | | | | 50 | 16.5 | 1.8 | 18.2 |
| | | | | 120 | 110.0 | 47.1 | 157.1 |
| | | | | 175 | 4.3 | 17.2 | 21.5 |
| | | | | 250 | 5.9 | 33.6 | 39.5 |
| | | | | 500 | 5.2 | 47.1 | 52.3 |
| | | | | 750 | 0.2 | 1.9 | 2.1 |
| | | | | >750 | 0.1 | 0.5 | 0.6 |
| | | | Generator Sets | 15 | 89.4 | 0.0 | 89.4 |
| | | | | 25 | 65.4 | 0.0 | 65.4 |
| | | | | 50 | 80.0 | 8.9 | 88.9 |
| | | | | 120 | 123.7 | 53.0 | 176.7 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 175 | 5.0 | 19.9 | 24.9 |
| | | | | 250 | 5.7 | 32.4 | 38.1 |
| | | | | 500 | 7.6 | 68.2 | 75.8 |
| | | | | 750 | 1.8 | 16.3 | 18.1 |
| | | | | >750 | 1.8 | 16.3 | 18.1 |
| | | | Pressure Washers | 15 | 4.2 | 0.0 | 4.2 |
| | | | | 25 | 1.0 | 0.0 | 1.0 |
| | | | | 50 | 1.9 | 0.1 | 2.0 |
| | | | | 120 | 0.8 | 0.3 | 1.1 |
| | | | Pumps | 15 | 67.2 | 0.0 | 67.2 |
| | | | | 25 | 20.1 | 0.0 | 20.1 |
| | | | | 50 | 35.0 | 3.8 | 38.8 |
| | | | | 120 | 68.6 | 29.5 | 98.1 |
| | | | | 175 | 7.9 | 31.5 | 39.3 |
| | | | | 250 | 3.0 | 17.2 | 20.2 |
| | | | | 500 | 6.1 | 54.6 | 60.7 |
| | | | | >750 | 0.4 | 3.4 | 3.8 |
| | | | Welders | 15 | 30.4 | 0.0 | 30.4 |
| | | | | 25 | 26.7 | 0.0 | 26.7 |
| | | | | 50 | 82.3 | 9.2 | 91.4 |
| | | | | 120 | 63.9 | 27.4 | 91.2 |
| | | | | 175 | 0.3 | 1.1 | 1.5 |
| | | Stanislaus | Air Compressors | 15 | 0.7 | 0.0 | 0.7 |
| | | | | 25 | 1.5 | 0.0 | 1.5 |
| | | | | 50 | 13.0 | 1.4 | 14.4 |
| | | | | 120 | 86.7 | 37.1 | 123.8 |
| | | | | 175 | 3.4 | 13.6 | 17.0 |
| | | | | 250 | 4.7 | 26.5 | 31.1 |
| | | | | 500 | 4.1 | 37.1 | 41.2 |
| | | | | 750 | 0.2 | 1.5 | 1.7 |
| | | | | >750 | 0.1 | 0.4 | 0.5 |
| | | | Generator Sets | 15 | 70.5 | 0.0 | 70.5 |
| | | | | 25 | 51.5 | 0.0 | 51.5 |
| | | | | 50 | 63.0 | 7.0 | 70.0 |
| | | | | 120 | 97.5 | 41.7 | 139.2 |
| | | | | 175 | 3.9 | 15.7 | 19.7 |
| | | | | 250 | 4.5 | 25.5 | 30.0 |
| | | | | 500 | 6.0 | 53.7 | 59.7 |
| | | | | 750 | 1.4 | 12.9 | 14.3 |
| | | | | >750 | 1.4 | 12.9 | 14.3 |
| | | | Pressure Washers | 15 | 3.3 | 0.0 | 3.3 |
| | | | | 25 | 0.8 | 0.0 | 0.8 |
| | | | | 50 | 1.5 | 0.1 | 1.6 |
| | | | | 120 | 0.6 | 0.2 | 0.8 |
| | | | Pumps | 15 | 52.9 | 0.0 | 52.9 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 25 | 15.8 | 0.0 | 15.8 |
| | | | | 50 | 27.6 | 3.0 | 30.6 |
| | | | | 120 | 54.1 | 23.2 | 77.3 |
| | | | | 175 | 6.2 | 24.8 | 31.0 |
| | | | | 250 | 2.4 | 13.5 | 15.9 |
| | | | | 500 | 4.8 | 43.0 | 47.8 |
| | | | | >750 | 0.3 | 2.7 | 3.0 |
| | | | Welders | 15 | 23.9 | 0.0 | 23.9 |
| | | | | 25 | 21.1 | 0.0 | 21.1 |
| | | | | 50 | 64.8 | 7.2 | 72.0 |
| | | | | 120 | 50.3 | 21.6 | 71.9 |
| | | | | 175 | 0.2 | 0.9 | 1.1 |
| | | Tulare | Air Compressors | 15 | 0.6 | 0.0 | 0.6 |
| | | | | 25 | 1.2 | 0.0 | 1.2 |
| | | | | 50 | 10.4 | 1.1 | 11.5 |
| | | | | 120 | 69.4 | 29.7 | 99.1 |
| | | | | 175 | 2.7 | 10.9 | 13.6 |
| | | | | 250 | 3.7 | 21.2 | 24.9 |
| | | | | 500 | 3.3 | 29.7 | 33.0 |
| | | | | 750 | 0.1 | 1.2 | 1.4 |
| | | | | >750 | 0.0 | 0.3 | 0.4 |
| | | | Generator Sets | 15 | 56.4 | 0.0 | 56.4 |
| | | | | 25 | 41.3 | 0.0 | 41.3 |
| | | | | 50 | 50.5 | 5.6 | 56.1 |
| | | | | 120 | 78.0 | 33.4 | 111.4 |
| | | | | 175 | 3.2 | 12.6 | 15.7 |
| | | | | 250 | 3.6 | 20.4 | 24.0 |
| | | | | 500 | 4.8 | 43.0 | 47.8 |
| | | | | 750 | 1.1 | 10.3 | 11.4 |
| | | | | >750 | 1.1 | 10.3 | 11.4 |
| | | | Pressure Washers | 15 | 2.6 | 0.0 | 2.6 |
| | | | | 25 | 0.6 | 0.0 | 0.6 |
| | | | | 50 | 1.2 | 0.1 | 1.3 |
| | | | | 120 | 0.5 | 0.2 | 0.7 |
| | | | Pumps | 15 | 42.4 | 0.0 | 42.4 |
| | | | | 25 | 12.7 | 0.0 | 12.7 |
| | | | | 50 | 22.1 | 2.4 | 24.5 |
| | | | | 120 | 43.3 | 18.6 | 61.9 |
| | | | | 175 | 5.0 | 19.9 | 24.8 |
| | | | | 250 | 1.9 | 10.8 | 12.8 |
| | | | | 500 | 3.8 | 34.4 | 38.3 |
| | | | | >750 | 0.2 | 2.1 | 2.4 |
| | | | Welders | 15 | 19.2 | 0.0 | 19.2 |
| | | | | 25 | 16.9 | 0.0 | 16.9 |
| | | | | 50 | 51.9 | 5.8 | 57.7 |
| | | | | 120 | 40.3 | 17.3 | 57.6 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| **District** | **Air Basin** | **County** | **Equipment Type** | **Horsepower Class** | **Mobile** | **Stationary** | **Total** |
| | | | | 175 | 0.2 | 0.7 | 0.9 |
| San Luis Obispo County APCD | South Central Coast | San Luis Obispo | Air Compressors | 15 | 0.4 | 0.0 | 0.4 |
| | | | | 25 | 0.8 | 0.0 | 0.8 |
| | | | | 50 | 6.9 | 0.7 | 7.7 |
| | | | | 120 | 46.2 | 19.8 | 66.0 |
| | | | | 175 | 1.8 | 7.2 | 9.1 |
| | | | | 250 | 2.5 | 14.1 | 16.6 |
| | | | | 500 | 2.2 | 19.8 | 22.0 |
| | | | | 750 | 0.1 | 0.8 | 0.9 |
| | | | | >750 | 0.0 | 0.2 | 0.3 |
| | | | Generator Sets | 15 | 37.6 | 0.0 | 37.6 |
| | | | | 25 | 27.5 | 0.0 | 27.5 |
| | | | | 50 | 33.6 | 3.7 | 37.4 |
| | | | | 120 | 52.0 | 22.3 | 74.3 |
| | | | | 175 | 2.1 | 8.4 | 10.5 |
| | | | | 250 | 2.4 | 13.6 | 16.0 |
| | | | | 500 | 3.2 | 28.7 | 31.8 |
| | | | | 750 | 0.8 | 6.9 | 7.6 |
| | | | | >750 | 0.8 | 6.9 | 7.6 |
| | | | Pressure Washers | 15 | 1.7 | 0.0 | 1.7 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 0.8 | 0.1 | 0.9 |
| | | | | 120 | 0.3 | 0.1 | 0.4 |
| | | | Pumps | 15 | 28.2 | 0.0 | 28.2 |
| | | | | 25 | 8.4 | 0.0 | 8.4 |
| | | | | 50 | 14.7 | 1.6 | 16.3 |
| | | | | 120 | 28.9 | 12.4 | 41.2 |
| | | | | 175 | 3.3 | 13.2 | 16.5 |
| | | | | 250 | 1.3 | 7.2 | 8.5 |
| | | | | 500 | 2.6 | 22.9 | 25.5 |
| | | | | >750 | 0.2 | 1.4 | 1.6 |
| | | | Welders | 15 | 12.8 | 0.0 | 12.8 |
| | | | | 25 | 11.2 | 0.0 | 11.2 |
| | | | | 50 | 34.6 | 3.9 | 38.4 |
| | | | | 120 | 26.9 | 11.5 | 38.4 |
| | | | | 175 | 0.1 | 0.5 | 0.6 |
| Santa Barbara County APCD | | Santa Barbara | Air Compressors | 15 | 0.6 | 0.0 | 0.6 |
| | | | | 25 | 1.3 | 0.0 | 1.3 |
| | | | | 50 | 11.1 | 1.2 | 12.3 |
| | | | | 120 | 74.1 | 31.7 | 105.8 |
| | | | | 175 | 2.9 | 11.6 | 14.5 |
| | | | | 250 | 4.0 | 22.6 | 26.6 |
| | | | | 500 | 3.5 | 31.7 | 35.2 |
| | | | | 750 | 0.1 | 1.3 | 1.4 |
| | | | | >750 | 0.0 | 0.4 | 0.4 |

## Attachment F
## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Generator Sets | 15 | 60.2 | 0.0 | 60.2 |
| | | | | 25 | 44.1 | 0.0 | 44.1 |
| | | | | 50 | 53.9 | 6.0 | 59.9 |
| | | | | 120 | 83.3 | 35.7 | 119.0 |
| | | | | 175 | 3.4 | 13.4 | 16.8 |
| | | | | 250 | 3.8 | 21.8 | 25.7 |
| | | | | 500 | 5.1 | 45.9 | 51.0 |
| | | | | 750 | 1.2 | 11.0 | 12.2 |
| | | | | >750 | 1.2 | 11.0 | 12.2 |
| | | | Pressure Washers | 15 | 2.8 | 0.0 | 2.8 |
| | | | | 25 | 0.6 | 0.0 | 0.6 |
| | | | | 50 | 1.3 | 0.1 | 1.4 |
| | | | | 120 | 0.5 | 0.2 | 0.7 |
| | | | Pumps | 15 | 45.2 | 0.0 | 45.2 |
| | | | | 25 | 13.5 | 0.0 | 13.5 |
| | | | | 50 | 23.6 | 2.6 | 26.1 |
| | | | | 120 | 46.2 | 19.8 | 66.1 |
| | | | | 175 | 5.3 | 21.2 | 26.5 |
| | | | | 250 | 2.0 | 11.6 | 13.6 |
| | | | | 500 | 4.1 | 36.8 | 40.9 |
| | | | | >750 | 0.3 | 2.3 | 2.5 |
| | | | Welders | 15 | 20.5 | 0.0 | 20.5 |
| | | | | 25 | 18.0 | 0.0 | 18.0 |
| | | | | 50 | 55.4 | 6.2 | 61.6 |
| | | | | 120 | 43.0 | 18.4 | 61.5 |
| | | | | 175 | 0.2 | 0.8 | 1.0 |
| Shasta County AQMD | Sacramento Valley | Shasta | Air Compressors | 15 | 0.3 | 0.0 | 0.3 |
| | | | | 25 | 0.5 | 0.0 | 0.5 |
| | | | | 50 | 4.6 | 0.5 | 5.2 |
| | | | | 120 | 31.1 | 13.3 | 44.4 |
| | | | | 175 | 1.2 | 4.9 | 6.1 |
| | | | | 250 | 1.7 | 9.5 | 11.2 |
| | | | | 500 | 1.5 | 13.3 | 14.8 |
| | | | | 750 | 0.1 | 0.5 | 0.6 |
| | | | | >750 | 0.0 | 0.2 | 0.2 |
| | | | Generator Sets | 15 | 25.3 | 0.0 | 25.3 |
| | | | | 25 | 18.5 | 0.0 | 18.5 |
| | | | | 50 | 22.6 | 2.5 | 25.1 |
| | | | | 120 | 35.0 | 15.0 | 49.9 |
| | | | | 175 | 1.4 | 5.6 | 7.0 |
| | | | | 250 | 1.6 | 9.2 | 10.8 |
| | | | | 500 | 2.1 | 19.3 | 21.4 |
| | | | | 750 | 0.5 | 4.6 | 5.1 |
| | | | | >750 | 0.5 | 4.6 | 5.1 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Pressure Washers | 15 | 1.2 | 0.0 | 1.2 |
| | | | | 25 | 0.3 | 0.0 | 0.3 |
| | | | | 50 | 0.5 | 0.0 | 0.6 |
| | | | | 120 | 0.2 | 0.1 | 0.3 |
| | | | Pumps | 15 | 19.0 | 0.0 | 19.0 |
| | | | | 25 | 5.7 | 0.0 | 5.7 |
| | | | | 50 | 9.9 | 1.1 | 11.0 |
| | | | | 120 | 19.4 | 8.3 | 27.7 |
| | | | | 175 | 2.2 | 8.9 | 11.1 |
| | | | | 250 | 0.9 | 4.9 | 5.7 |
| | | | | 500 | 1.7 | 15.4 | 17.1 |
| | | | | >750 | 0.1 | 1.0 | 1.1 |
| | | | Welders | 15 | 8.6 | 0.0 | 8.6 |
| | | | | 25 | 7.6 | 0.0 | 7.6 |
| | | | | 50 | 23.2 | 2.6 | 25.8 |
| | | | | 120 | 18.1 | 7.7 | 25.8 |
| | | | | 175 | 0.1 | 0.3 | 0.4 |
| Siskiyou County APCD | Northeast Plateau | Siskiyou | Air Compressors | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 1.2 | 0.1 | 1.3 |
| | | | | 120 | 8.0 | 3.4 | 11.5 |
| | | | | 175 | 0.3 | 1.3 | 1.6 |
| | | | | 250 | 0.4 | 2.5 | 2.9 |
| | | | | 500 | 0.4 | 3.4 | 3.8 |
| | | | | 750 | 0.0 | 0.1 | 0.2 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 6.5 | 0.0 | 6.5 |
| | | | | 25 | 4.8 | 0.0 | 4.8 |
| | | | | 50 | 5.9 | 0.7 | 6.5 |
| | | | | 120 | 9.0 | 3.9 | 12.9 |
| | | | | 175 | 0.4 | 1.5 | 1.8 |
| | | | | 250 | 0.4 | 2.4 | 2.8 |
| | | | | 500 | 0.6 | 5.0 | 5.5 |
| | | | | 750 | 0.1 | 1.2 | 1.3 |
| | | | | >750 | 0.1 | 1.2 | 1.3 |
| | | | Pressure Washers | 15 | 0.3 | 0.0 | 0.3 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.1 | 0.0 | 0.1 |
| | | | | 120 | 0.1 | 0.0 | 0.1 |
| | | | Pumps | 15 | 4.9 | 0.0 | 4.9 |
| | | | | 25 | 1.5 | 0.0 | 1.5 |
| | | | | 50 | 2.6 | 0.3 | 2.8 |
| | | | | 120 | 5.0 | 2.2 | 7.2 |
| | | | | 175 | 0.6 | 2.3 | 2.9 |
| | | | | 250 | 0.2 | 1.3 | 1.5 |

# Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 500 | 0.4 | 4.0 | 4.4 |
| | | | | >750 | 0.0 | 0.2 | 0.3 |
| | | | Welders | 15 | 2.2 | 0.0 | 2.2 |
| | | | | 25 | 2.0 | 0.0 | 2.0 |
| | | | | 50 | 6.0 | 0.7 | 6.7 |
| | | | | 120 | 4.7 | 2.0 | 6.7 |
| | | | | 175 | 0.0 | 0.1 | 0.1 |
| South Coast AQMD | Mojave Desert | Riverside | Air Compressors | 15 | 0.0 | 0.0 | 0.0 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.3 | 0.0 | 0.3 |
| | | | | 120 | 1.8 | 0.8 | 2.6 |
| | | | | 175 | 0.1 | 0.3 | 0.4 |
| | | | | 250 | 0.1 | 0.6 | 0.7 |
| | | | | 500 | 0.1 | 0.8 | 0.9 |
| | | | | 750 | 0.0 | 0.0 | 0.0 |
| | | | | >750 | 0.0 | 0.0 | 0.0 |
| | | | Generator Sets | 15 | 1.5 | 0.0 | 1.5 |
| | | | | 25 | 1.1 | 0.0 | 1.1 |
| | | | | 50 | 1.3 | 0.1 | 1.5 |
| | | | | 120 | 2.1 | 0.9 | 2.9 |
| | | | | 175 | 0.1 | 0.3 | 0.4 |
| | | | | 250 | 0.1 | 0.5 | 0.6 |
| | | | | 500 | 0.1 | 1.1 | 1.3 |
| | | | | 750 | 0.0 | 0.3 | 0.3 |
| | | | | >750 | 0.0 | 0.3 | 0.3 |
| | | | Pressure Washers | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.0 | 0.0 | 0.0 |
| | | | | 50 | 0.0 | 0.0 | 0.0 |
| | | | | 120 | 0.0 | 0.0 | 0.0 |
| | | | Pumps | 15 | 1.1 | 0.0 | 1.1 |
| | | | | 25 | 0.3 | 0.0 | 0.3 |
| | | | | 50 | 0.6 | 0.1 | 0.6 |
| | | | | 120 | 1.1 | 0.5 | 1.6 |
| | | | | 175 | 0.1 | 0.5 | 0.7 |
| | | | | 250 | 0.1 | 0.3 | 0.3 |
| | | | | 500 | 0.1 | 0.9 | 1.0 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Welders | 15 | 0.5 | 0.0 | 0.5 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 1.4 | 0.2 | 1.5 |
| | | | | 120 | 1.1 | 0.5 | 1.5 |
| | | | | 175 | 0.0 | 0.0 | 0.0 |
| | Salton Sea | | Air Compressors | 15 | 0.5 | 0.0 | 0.5 |
| | | | | 25 | 1.1 | 0.0 | 1.1 |
| | | | | 50 | 9.5 | 1.0 | 10.6 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 120 | 63.8 | 27.3 | 91.1 |
| | | | | 175 | 2.5 | 10.0 | 12.5 |
| | | | | 250 | 3.4 | 19.5 | 22.9 |
| | | | | 500 | 3.0 | 27.3 | 30.3 |
| | | | | 750 | 0.1 | 1.1 | 1.2 |
| | | | | >750 | 0.0 | 0.3 | 0.4 |
| | | | Generator Sets | 15 | 51.8 | 0.0 | 51.8 |
| | | | | 25 | 37.9 | 0.0 | 37.9 |
| | | | | 50 | 46.4 | 5.2 | 51.5 |
| | | | | 120 | 71.7 | 30.7 | 102.4 |
| | | | | 175 | 2.9 | 11.6 | 14.5 |
| | | | | 250 | 3.3 | 18.8 | 22.1 |
| | | | | 500 | 4.4 | 39.5 | 43.9 |
| | | | | 750 | 1.0 | 9.5 | 10.5 |
| | | | | >750 | 1.0 | 9.5 | 10.5 |
| | | | Pressure Washers | 15 | 2.4 | 0.0 | 2.4 |
| | | | | 25 | 0.6 | 0.0 | 0.6 |
| | | | | 50 | 1.1 | 0.1 | 1.2 |
| | | | | 120 | 0.5 | 0.2 | 0.6 |
| | | | Pumps | 15 | 38.9 | 0.0 | 38.9 |
| | | | | 25 | 11.6 | 0.0 | 11.6 |
| | | | | 50 | 20.3 | 2.2 | 22.5 |
| | | | | 120 | 39.8 | 17.1 | 56.9 |
| | | | | 175 | 4.6 | 18.2 | 22.8 |
| | | | | 250 | 1.8 | 10.0 | 11.7 |
| | | | | 500 | 3.5 | 31.6 | 35.2 |
| | | | | >750 | 0.2 | 2.0 | 2.2 |
| | | | Welders | 15 | 17.6 | 0.0 | 17.6 |
| | | | | 25 | 15.5 | 0.0 | 15.5 |
| | | | | 50 | 47.7 | 5.3 | 53.0 |
| | | | | 120 | 37.0 | 15.9 | 52.9 |
| | | | | 175 | 0.2 | 0.7 | 0.8 |
| | South Coast | Los Angeles | Air Compressors | 15 | 14.4 | 0.0 | 14.4 |
| | | | | 25 | 29.7 | 0.0 | 29.7 |
| | | | | 50 | 260.6 | 28.3 | 288.9 |
| | | | | 120 | 1742.6 | 746.7 | 2489.3 |
| | | | | 175 | 68.1 | 273.1 | 341.2 |
| | | | | 250 | 93.8 | 532.3 | 626.1 |
| | | | | 500 | 82.8 | 745.6 | 828.4 |
| | | | | 750 | 3.5 | 30.4 | 33.9 |
| | | | | >750 | 1.1 | 8.7 | 9.8 |
| | | | Generator Sets | 15 | 1416.7 | 0.0 | 1416.7 |
| | | | | 25 | 1036.3 | 0.0 | 1036.3 |
| | | | | 50 | 1266.9 | 141.3 | 1408.2 |
| | | | | 120 | 1959.4 | 839.0 | 2798.4 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 175 | 79.1 | 316.0 | 395.1 |
| | | | | 250 | 90.3 | 513.0 | 603.3 |
| | | | | 500 | 120.1 | 1080.0 | 1200.1 |
| | | | | 750 | 28.6 | 258.4 | 287.0 |
| | | | | >750 | 28.6 | 258.4 | 287.0 |
| | | | Pressure Washers | 15 | 65.8 | 0.0 | 65.8 |
| | | | | 25 | 15.3 | 0.0 | 15.3 |
| | | | | 50 | 30.3 | 2.2 | 32.5 |
| | | | | 120 | 12.4 | 4.3 | 16.8 |
| | | | Pumps | 15 | 1064.0 | 0.0 | 1064.0 |
| | | | | 25 | 317.8 | 0.0 | 317.8 |
| | | | | 50 | 553.9 | 60.3 | 614.3 |
| | | | | 120 | 1087.4 | 466.8 | 1554.2 |
| | | | | 175 | 124.7 | 498.6 | 623.3 |
| | | | | 250 | 47.9 | 272.3 | 320.2 |
| | | | | 500 | 96.1 | 864.9 | 961.0 |
| | | | | >750 | 6.0 | 53.8 | 59.8 |
| | | | Welders | 15 | 481.2 | 0.0 | 481.2 |
| | | | | 25 | 423.5 | 0.0 | 423.5 |
| | | | | 50 | 1303.0 | 145.4 | 1448.4 |
| | | | | 120 | 1012.0 | 433.4 | 1445 |
| | | | | 175 | 4.9 | 18.2 | 23.[illegible] |
| | | Orange | Air Compressors | 15 | 4.4 | 0.0 | 4.4 |
| | | | | 25 | 9.2 | 0.0 | 9.2 |
| | | | | 50 | 80.3 | 8.7 | 89.0 |
| | | | | 120 | 536.8 | 230.0 | 766.8 |
| | | | | 175 | 21.0 | 84.1 | 105.1 |
| | | | | 250 | 28.9 | 164.0 | 192.8 |
| | | | | 500 | 25.5 | 229.7 | 255.2 |
| | | | | 750 | 1.1 | 9.4 | 10.4 |
| | | | | >750 | 0.4 | 2.7 | 3.0 |
| | | | Generator Sets | 15 | 436.4 | 0.0 | 436.4 |
| | | | | 25 | 319.2 | 0.0 | 319.2 |
| | | | | 50 | 390.2 | 43.5 | 433.8 |
| | | | | 120 | 603.5 | 258.4 | 862.0 |
| | | | | 175 | 24.4 | 97.3 | 121.7 |
| | | | | 250 | 27.8 | 158.0 | 185.8 |
| | | | | 500 | 37.0 | 332.7 | 369.7 |
| | | | | 750 | 8.8 | 79.6 | 88.4 |
| | | | | >750 | 8.8 | 79.6 | 88.4 |
| | | | Pressure Washers | 15 | 20.3 | 0.0 | 20.3 |
| | | | | 25 | 4.7 | 0.0 | 4.7 |
| | | | | 50 | 9.3 | 0.7 | 10.0 |
| | | | | 120 | 3.8 | 1.3 | 5.2 |
| | | | Pumps | 15 | 327.7 | 0.0 | 327.7 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 25 | 97.9 | 0.0 | 97.9 |
| | | | | 50 | 170.6 | 18.6 | 189.2 |
| | | | | 120 | 334.9 | 143.8 | 478.7 |
| | | | | 175 | 38.4 | 153.6 | 192.0 |
| | | | | 250 | 14.8 | 83.9 | 98.6 |
| | | | | 500 | 29.6 | 266.4 | 296.0 |
| | | | | >750 | 1.9 | 16.6 | 18.4 |
| | | | Welders | 15 | 148.2 | 0.0 | 148.2 |
| | | | | 25 | 130.4 | 0.0 | 130.4 |
| | | | | 50 | 401.4 | 44.8 | 446.1 |
| | | | | 120 | 311.7 | 133.5 | 445.2 |
| | | | | 175 | 1.5 | 5.6 | 7.1 |
| | | Riverside | Air Compressors | 15 | 2.0 | 0.0 | 2.0 |
| | | | | 25 | 4.0 | 0.0 | 4.0 |
| | | | | 50 | 35.3 | 3.8 | 39.1 |
| | | | | 120 | 235.8 | 101.0 | 336.9 |
| | | | | 175 | 9.2 | 37.0 | 46.2 |
| | | | | 250 | 12.7 | 72.0 | 84.7 |
| | | | | 500 | 11.2 | 100.9 | 112.1 |
| | | | | 750 | 0.5 | 4.1 | 4.6 |
| | | | | >750 | 0.2 | 1.2 | 1.3 |
| | | | Generator Sets | 15 | 191.7 | 0.0 | 191.7 |
| | | | | 25 | 140.2 | 0.0 | 140.2 |
| | | | | 50 | 171.5 | 19.1 | 190.6 |
| | | | | 120 | 265.2 | 113.6 | 378.7 |
| | | | | 175 | 10.7 | 42.8 | 53.5 |
| | | | | 250 | 12.2 | 69.4 | 81.7 |
| | | | | 500 | 16.3 | 146.2 | 162.4 |
| | | | | 750 | 3.9 | 35.0 | 38.8 |
| | | | | >750 | 3.9 | 35.0 | 38.8 |
| | | | Pressure Washers | 15 | 8.9 | 0.0 | 8.9 |
| | | | | 25 | 2.1 | 0.0 | 2.1 |
| | | | | 50 | 4.1 | 0.3 | 4.4 |
| | | | | 120 | 1.7 | 0.6 | 2.3 |
| | | | Pumps | 15 | 144.0 | 0.0 | 144.0 |
| | | | | 25 | 43.0 | 0.0 | 43.0 |
| | | | | 50 | 75.0 | 8.2 | 83.1 |
| | | | | 120 | 147.2 | 63.2 | 210.3 |
| | | | | 175 | 16.9 | 67.5 | 84.4 |
| | | | | 250 | 6.5 | 36.8 | 43.3 |
| | | | | 500 | 13.0 | 117.0 | 130.1 |
| | | | | >750 | 0.8 | 7.3 | 8.1 |
| | | | Welders | 15 | 65.1 | 0.0 | 65.1 |
| | | | | 25 | 57.3 | 0.0 | 57.3 |
| | | | | 50 | 176.3 | 19.7 | 196.0 |
| | | | | 120 | 137.0 | 58.7 | 195.6 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 175 | 0.7 | 2.5 | 3.1 |
| | | San Bernardino | Air Compressors | 15 | 2.1 | 0.0 | 2.1 |
| | | | | 25 | 4.4 | 0.0 | 4.4 |
| | | | | 50 | 38.3 | 4.2 | 42.4 |
| | | | | 120 | 256.0 | 109.7 | 365.7 |
| | | | | 175 | 10.0 | 40.1 | 50.1 |
| | | | | 250 | 13.8 | 78.2 | 92.0 |
| | | | | 500 | 12.2 | 109.5 | 121.7 |
| | | | | 750 | 0.5 | 4.5 | 5.0 |
| | | | | >750 | 0.2 | 1.3 | 1.4 |
| | | | Generator Sets | 15 | 208.1 | 0.0 | 208.1 |
| | | | | 25 | 152.2 | 0.0 | 152.2 |
| | | | | 50 | 186.1 | 20.8 | 206.9 |
| | | | | 120 | 287.8 | 123.3 | 411.1 |
| | | | | 175 | 11.6 | 46.4 | 58.0 |
| | | | | 250 | 13.3 | 75.4 | 88.6 |
| | | | | 500 | 17.6 | 158.7 | 176.3 |
| | | | | 750 | 4.2 | 38.0 | 42.2 |
| | | | | >750 | 4.2 | 38.0 | 42.2 |
| | | | Pressure Washers | 15 | 9.7 | 0.0 | 9.7 |
| | | | | 25 | 2.2 | 0.0 | 2.2 |
| | | | | 50 | 4.5 | 0.3 | 4.8 |
| | | | | 120 | 1.8 | 0.6 | 2.5 |
| | | | Pumps | 15 | 156.3 | 0.0 | 156.3 |
| | | | | 25 | 46.7 | 0.0 | 46.7 |
| | | | | 50 | 81.4 | 8.9 | 90.2 |
| | | | | 120 | 159.7 | 68.6 | 228.3 |
| | | | | 175 | 18.3 | 73.2 | 91.6 |
| | | | | 250 | 7.0 | 40.0 | 47.0 |
| | | | | 500 | 14.1 | 127.0 | 141.2 |
| | | | | >750 | 0.9 | 7.9 | 8.8 |
| | | | Welders | 15 | 70.7 | 0.0 | 70.7 |
| | | | | 25 | 62.2 | 0.0 | 62.2 |
| | | | | 50 | 191.4 | 21.4 | 212.8 |
| | | | | 120 | 148.7 | 63.7 | 212.3 |
| | | | | 175 | 0.7 | 2.7 | 3.4 |
| Tehama County APCD | Sacramento Valley | Tehama | Air Compressors | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 1.6 | 0.2 | 1.7 |
| | | | | 120 | 10.4 | 4.5 | 14.9 |
| | | | | 175 | 0.4 | 1.6 | 2.0 |
| | | | | 250 | 0.6 | 3.2 | 3.7 |
| | | | | 500 | 0.5 | 4.5 | 4.9 |
| | | | | 750 | 0.0 | 0.2 | 0.2 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |

# Attachment F
## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Generator Sets | 15 | 8.5 | 0.0 | 8.5 |
| | | | | 25 | 6.2 | 0.0 | 6.2 |
| | | | | 50 | 7.6 | 0.8 | 8.4 |
| | | | | 120 | 11.7 | 5.0 | 16.7 |
| | | | | 175 | 0.5 | 1.9 | 2.4 |
| | | | | 250 | 0.5 | 3.1 | 3.6 |
| | | | | 500 | 0.7 | 6.5 | 7.2 |
| | | | | 750 | 0.2 | 1.5 | 1.7 |
| | | | | >750 | 0.2 | 1.5 | 1.7 |
| | | | Pressure Washers | 15 | 0.4 | 0.0 | 0.4 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.2 | 0.0 | 0.2 |
| | | | | 120 | 0.1 | 0.0 | 0.1 |
| | | | Pumps | 15 | 6.4 | 0.0 | 6.4 |
| | | | | 25 | 1.9 | 0.0 | 1.9 |
| | | | | 50 | 3.3 | 0.4 | 3.7 |
| | | | | 120 | 6.5 | 2.8 | 9.3 |
| | | | | 175 | 0.7 | 3.0 | 3.7 |
| | | | | 250 | 0.3 | 1.6 | 1.9 |
| | | | | 500 | 0.6 | 5.2 | 5.7 |
| | | | | >750 | 0.0 | 0.3 | 0.4 |
| | | | Welders | 15 | 2.9 | 0.0 | 2.9 |
| | | | | 25 | 2.5 | 0.0 | 2.5 |
| | | | | 50 | 7.8 | 0.9 | 8.7 |
| | | | | 120 | 6.0 | 2.6 | 8.6 |
| | | | | 175 | 0.0 | 0.1 | 0.1 |
| Tuolumne County APCD | Mountain Counties | Tuolumne | Air Compressors | 15 | 0.1 | 0.0 | 0.1 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 1.5 | 0.2 | 1.7 |
| | | | | 120 | 10.2 | 4.4 | 14.6 |
| | | | | 175 | 0.4 | 1.6 | 2.0 |
| | | | | 250 | 0.5 | 3.1 | 3.7 |
| | | | | 500 | 0.5 | 4.4 | 4.9 |
| | | | | 750 | 0.0 | 0.2 | 0.2 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Generator Sets | 15 | 8.3 | 0.0 | 8.3 |
| | | | | 25 | 6.1 | 0.0 | 6.1 |
| | | | | 50 | 7.4 | 0.8 | 8.3 |
| | | | | 120 | 11.5 | 4.9 | 16.4 |
| | | | | 175 | 0.5 | 1.9 | 2.3 |
| | | | | 250 | 0.5 | 3.0 | 3.5 |
| | | | | 500 | 0.7 | 6.3 | 7.0 |
| | | | | 750 | 0.2 | 1.5 | 1.7 |
| | | | | >750 | 0.2 | 1.5 | 1.7 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | Pressure Washers | 15 | 0.4 | 0.0 | 0.4 |
| | | | | 25 | 0.1 | 0.0 | 0.1 |
| | | | | 50 | 0.2 | 0.0 | 0.2 |
| | | | | 120 | 0.1 | 0.0 | 0.1 |
| | | | Pumps | 15 | 6.2 | 0.0 | 6.2 |
| | | | | 25 | 1.9 | 0.0 | 1.9 |
| | | | | 50 | 3.2 | 0.4 | 3.6 |
| | | | | 120 | 6.4 | 2.7 | 9.1 |
| | | | | 175 | 0.7 | 2.9 | 3.7 |
| | | | | 250 | 0.3 | 1.6 | 1.9 |
| | | | | 500 | 0.6 | 5.1 | 5.6 |
| | | | | >750 | 0.0 | 0.3 | 0.4 |
| | | | Welders | 15 | 2.8 | 0.0 | 2.8 |
| | | | | 25 | 2.5 | 0.0 | 2.5 |
| | | | | 50 | 7.6 | 0.9 | 8.5 |
| | | | | 120 | 5.9 | 2.5 | 8.5 |
| | | | | 175 | 0.0 | 0.1 | 0.1 |
| Ventura County APCD | South Central Coast | Ventura | Air Compressors | 15 | 1.2 | 0.0 | 1.2 |
| | | | | 25 | 2.4 | 0.0 | 2.4 |
| | | | | 50 | 21.4 | 2.3 | 23.7 |
| | | | | 120 | 142.7 | 61.2 | 203.. |
| | | | | 175 | 5.6 | 22.4 | 27.9 |
| | | | | 250 | 7.7 | 43.6 | 51.3 |
| | | | | 500 | 6.8 | 61.1 | 67.9 |
| | | | | 750 | 0.3 | 2.5 | 2.8 |
| | | | | >750 | 0.1 | 0.7 | 0.8 |
| | | | Generator Sets | 15 | 116.0 | 0.0 | 116.0 |
| | | | | 25 | 84.9 | 0.0 | 84.9 |
| | | | | 50 | 103.8 | 11.6 | 115.4 |
| | | | | 120 | 160.5 | 68.7 | 229.2 |
| | | | | 175 | 6.5 | 25.9 | 32.4 |
| | | | | 250 | 7.4 | 42.0 | 49.4 |
| | | | | 500 | 9.8 | 88.5 | 98.3 |
| | | | | 750 | 2.3 | 21.2 | 23.5 |
| | | | | >750 | 2.3 | 21.2 | 23.5 |
| | | | Pressure Washers | 15 | 5.4 | 0.0 | 5.4 |
| | | | | 25 | 1.3 | 0.0 | 1.3 |
| | | | | 50 | 2.5 | 0.2 | 2.7 |
| | | | | 120 | 1.0 | 0.4 | 1.4 |
| | | | Pumps | 15 | 87.2 | 0.0 | 87.2 |
| | | | | 25 | 26.0 | 0.0 | 26.0 |
| | | | | 50 | 45.4 | 4.9 | 50.3 |
| | | | | 120 | 89.1 | 38.2 | 127 |
| | | | | 175 | 10.2 | 40.8 | 51. |
| | | | | 250 | 3.9 | 22.3 | 26.2 |

# Attachment F
## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 500 | 7.9 | 70.8 | 78.7 |
| | | | | >750 | 0.5 | 4.4 | 4.9 |
| | | | Welders | 15 | 39.4 | 0.0 | 39.4 |
| | | | | 25 | 34.7 | 0.0 | 34.7 |
| | | | | 50 | 106.7 | 11.9 | 118.6 |
| | | | | 120 | 82.9 | 35.5 | 118.4 |
| | | | | 175 | 0.4 | 1.5 | 1.9 |
| Yolo/Solano AQMD | Sacramento Valley | Solano | Air Compressors | 15 | 0.2 | 0.0 | 0.2 |
| | | | | 25 | 0.4 | 0.0 | 0.4 |
| | | | | 50 | 3.4 | 0.4 | 3.8 |
| | | | | 120 | 22.8 | 9.8 | 32.5 |
| | | | | 175 | 0.9 | 3.6 | 4.5 |
| | | | | 250 | 1.2 | 7.0 | 8.2 |
| | | | | 500 | 1.1 | 9.7 | 10.8 |
| | | | | 750 | 0.0 | 0.4 | 0.4 |
| | | | | >750 | 0.0 | 0.1 | 0.1 |
| | | | Generator Sets | 15 | 18.5 | 0.0 | 18.5 |
| | | | | 25 | 13.5 | 0.0 | 13.5 |
| | | | | 50 | 16.6 | 1.8 | 18.4 |
| | | | | 120 | 25.6 | 11.0 | 36.6 |
| | | | | 175 | 1.0 | 4.1 | 5.2 |
| | | | | 250 | 1.2 | 6.7 | 7.9 |
| | | | | 500 | 1.6 | 14.1 | 15.7 |
| | | | | 750 | 0.4 | 3.4 | 3.8 |
| | | | | >750 | 0.4 | 3.4 | 3.8 |
| | | | Pressure Washers | 15 | 0.9 | 0.0 | 0.9 |
| | | | | 25 | 0.2 | 0.0 | 0.2 |
| | | | | 50 | 0.4 | 0.0 | 0.4 |
| | | | | 120 | 0.2 | 0.1 | 0.2 |
| | | | Pumps | 15 | 13.9 | 0.0 | 13.9 |
| | | | | 25 | 4.2 | 0.0 | 4.2 |
| | | | | 50 | 7.2 | 0.8 | 8.0 |
| | | | | 120 | 14.2 | 6.1 | 20.3 |
| | | | | 175 | 1.6 | 6.5 | 8.1 |
| | | | | 250 | 0.6 | 3.6 | 4.2 |
| | | | | 500 | 1.3 | 11.3 | 12.6 |
| | | | | >750 | 0.1 | 0.7 | 0.8 |
| | | | Welders | 15 | 6.3 | 0.0 | 6.3 |
| | | | | 25 | 5.5 | 0.0 | 5.5 |
| | | | | 50 | 17.0 | 1.9 | 18.9 |
| | | | | 120 | 13.2 | 5.7 | 18.9 |
| | | | | 175 | 0.1 | 0.2 | 0.3 |
| | | Yolo | Air Compressors | 15 | 0.3 | 0.0 | 0.3 |
| | | | | 25 | 0.6 | 0.0 | 0.6 |
| | | | | 50 | 4.9 | 0.5 | 5.4 |

## Attachment F

## 2002 OFFROAD-PSR Stationary Diesel Population

| Location | | | Equipment | | | | |
|---|---|---|---|---|---|---|---|
| District | Air Basin | County | Equipment Type | Horsepower Class | Mobile | Stationary | Total |
| | | | | 120 | 32.5 | 13.9 | 46.5 |
| | | | | 175 | 1.3 | 5.1 | 6.4 |
| | | | | 250 | 1.8 | 9.9 | 11.7 |
| | | | | 500 | 1.5 | 13.9 | 15.5 |
| | | | | 750 | 0.1 | 0.6 | 0.6 |
| | | | | >750 | 0.0 | 0.2 | 0.2 |
| | | | Generator Sets | 15 | 26.4 | 0.0 | 26.4 |
| | | | | 25 | 19.3 | 0.0 | 19.3 |
| | | | | 50 | 23.6 | 2.6 | 26.3 |
| | | | | 120 | 36.6 | 15.7 | 52.2 |
| | | | | 175 | 1.5 | 5.9 | 7.4 |
| | | | | 250 | 1.7 | 9.6 | 11.3 |
| | | | | 500 | 2.2 | 20.2 | 22.4 |
| | | | | 750 | 0.5 | 4.8 | 5.4 |
| | | | | >750 | 0.5 | 4.8 | 5.4 |
| | | | Pressure Washers | 15 | 1.2 | 0.0 | 1.2 |
| | | | | 25 | 0.3 | 0.0 | 0.3 |
| | | | | 50 | 0.6 | 0.0 | 0.6 |
| | | | | 120 | 0.2 | 0.1 | 0.3 |
| | | | Pumps | 15 | 19.9 | 0.0 | 19.9 |
| | | | | 25 | 5.9 | 0.0 | 5.9 |
| | | | | 50 | 10.3 | 1.1 | 11.5 |
| | | | | 120 | 20.3 | 8.7 | 29.0 |
| | | | | 175 | 2.3 | 9.3 | 11.6 |
| | | | | 250 | 0.9 | 5.1 | 6.0 |
| | | | | 500 | 1.8 | 16.1 | 17.9 |
| | | | | >750 | 0.1 | 1.0 | 1.1 |
| | | | Welders | 15 | 9.0 | 0.0 | 9.0 |
| | | | | 25 | 7.9 | 0.0 | 7.9 |
| | | | | 50 | 24.3 | 2.7 | 27.0 |
| | | | | 120 | 18.9 | 8.1 | 27.0 |
| | | | | 175 | 0.1 | 0.3 | 0.4 |
| | | | | **Statewide Total** | 55091.9 | 31619.0 | 86710.9 |

Attachment G

# Air Resources Board


**Alan C. Lloyd, Ph.D.**
**Chairman**
1001 I Street • P.O. Box 2815 • Sacramento, California 95812 • www.arb.ca.gov

**"'inston H. Hickox**
*ency Secretary*

**Gray Davis**
*Governor*


MEMORANDUM

TO: Randy Pasek, Chief, Emission Inventory Branch

FROM: Michael Benjamin, Manager, Emission Inventory Systems Section

DATE: March 27, 2003

SUBJECT: **Updated Agricultural Irrigation Pump Emission Inventory**

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With the assistance of local air district staff, we have updated the statewide emission inventory for diesel-fueled agricultural irrigation pumps. Agricultural irrigation engines (EIC 052-042-1200-0000) is one of the area source categories for which the local air districts are responsible for estimating emissions. As part of this update process, we contacted seventeen air districts with significant irrigated agricultural acreage to obtain their best estimates of the current population and emissions from stationary and mobile diesel-fueled agricultural irrigation engines. The revised statewide population and emission estimates are provided in Table 1. We estimate there are approximately 8,200 diesel-fueled agricultural irrigation pumps statewide that emit 4.7 tons per day (tpd) of ROG, 48.9 tpd of NOx, and 3.7 tpd of PM on an average summer day.

Specific to the San Joaquin Valley, the updated information differs from that recently discussed by the Emission Inventory Subcommittee of the California Air Resources Board Agriculture Advisory Committee for Air Quality. As directed by the Subcommittee on February 19, we have worked with staff from the San Joaquin Valley UAPCD to explicitly account for the benefits of the Carl Moyer Program. As you can see in Table 2, although the number of pumps in the SJV has increased, the overall emissions have not changed significantly since we also revised our assumptions about the number of operating hours and emission factors. We will be providing the EI Subcommittee with a written report that will discuss in greater detail the assumptions used in developing the revised inventory for the SJV.

# Attachment G

Table 1. Statewide Population and Summer Emissions for Diesel-Fueled Agricultural Irrigation Pumps

| | | | COUNTY TOTALS | SUMMER EMISSIONS (TPD) | | | REGION TOTALS | SUMMER EMISSIONS (TPD) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Region | Air District | County | POPULATION | ROG | NOX | PM | POPULATION | ROG | NOX | PM |
| North Central Coast | Monterey Bay Unified APCD | Monterey | 450 | 0.123 | 0.970 | 0.069 | | | | |
| North Central Coast | Monterey Bay Unified APCD | Santa Cruz | 62 | 0.017 | 0.134 | 0.010 | | | | |
| North Central Coast | Monterey Bay Unified APCD | San Benito | 56 | 0.015 | 0.120 | 0.008 | 568 | 0.155 | 1.224 | 0.087 |
| Sacramento Nonattainment | El Dorado County APCD | El Dorado | 20 | 0.005 | 0.073 | 0.005 | | | | |
| Sacramento Nonattainment | Feather River AQMD | Sutter | 181 | 0.244 | 2.768 | 0.204 | | | | |
| Sacramento Nonattainment | Placer County APCD | Placer | 64 | 0.023 | 0.284 | 0.021 | | | | |
| Sacramento Nonattainment | Sacramento Metropolitan AQMD | Sacramento | 122 | 0.040 | 0.505 | 0.036 | | | | |
| Sacramento Nonattainment | Yolo/Solano AQMD | Solano | 134 | 0.073 | 0.868 | 0.063 | | | | |
| Sacramento Nonattainment | Yolo/Solano AQMD | Yolo | 643 | 0.426 | 4.889 | 0.353 | 1164 | 0.812 | 9.387 | 0.682 |
| Sacramento Valley Attainment | Butte County AQMD | Butte | 163 | 0.044 | 0.351 | 0.025 | | | | |
| Sacramento Valley Attainment | Colusa County APCD | Colusa | 100 | 0.026 | 0.214 | 0.016 | | | | |
| Sacramento Valley Attainment | Glenn County APCD | Glenn | 130 | 0.034 | 0.280 | 0.020 | | | | |
| Sacramento Valley Attainment | Tehama County APCD | Tehama | 200 | 0.053 | 0.427 | 0.030 | 593 | 0.158 | 1.271 | 0.091 |
| Salton Sea | Imperial County APCD | Imperial | 200 | 0.053 | 0.430 | 0.031 | 200 | 0.053 | 0.430 | 0.031 |
| San Diego | San Diego County APCD | San Diego | 75 | 0.020 | 0.161 | 0.011 | 75 | 0.020 | 0.161 | 0.011 |
| San Francisco | Bay Area AQMD | Alameda | 35 | 0.009 | 0.075 | 0.005 | | | | |
| San Francisco | Bay Area AQMD | Contra Costa | 44 | 0.012 | 0.095 | 0.007 | | | | |
| San Francisco | Bay Area AQMD | Marin | 17 | 0.005 | 0.037 | 0.002 | | | | |
| San Francisco | Bay Area AQMD | Napa | 74 | 0.019 | 0.159 | 0.011 | | | | |
| San Francisco | Bay Area AQMD | San Francisco | 0 | 0.000 | 0.000 | 0.000 | | | | |
| San Francisco | Bay Area AQMD | San Mateo | 21 | 0.006 | 0.045 | 0.003 | | | | |
| San Francisco | Bay Area AQMD | Santa Clara | 82 | 0.022 | 0.175 | 0.012 | | | | |
| San Francisco | Bay Area AQMD | Solano | 0 | 0.000 | 0.000 | 0.000 | | | | |
| San Francisco | Bay Area AQMD | Sonoma | 147 | 0.040 | 0.315 | 0.022 | 420 | 0.113 | 0.901 | 0.062 |
| San Joaquin Valley | San Joaquin Valley Unified APCD | Fresno | 1415 | 0.638 | 8.395 | 0.674 | | | | |
| San Joaquin Valley | San Joaquin Valley Unified APCD | Kern | 1066 | 0.661 | 6.848 | 0.525 | | | | |
| San Joaquin Valley | San Joaquin Valley Unified APCD | Kings | 525 | 0.222 | 3.152 | 0.281 | | | | |
| San Joaquin Valley | San Joaquin Valley Unified APCD | Madera | 414 | 0.193 | 2.437 | 0.187 | | | | |
| San Joaquin Valley | San Joaquin Valley Unified APCD | Merced | 270 | 0.144 | 1.609 | 0.128 | | | | |
| San Joaquin Valley | San Joaquin Valley Unified APCD | San Joaquin | 413 | 0.185 | 2.417 | 0.187 | | | | |
| San Joaquin Valley | San Joaquin Valley Unified APCD | Stanislaus | 111 | 0.047 | 0.660 | 0.052 | | | | |
| San Joaquin Valley | San Joaquin Valley Unified APCD | Tulare | 286 | 0.705 | 2.946 | 0.145 | 4500 | 2.796 | 28.465 | 2.179 |
| South Central Coast | Santa Barbara County APCD | Santa Barbara | 100 | 0.188 | 2.294 | 0.167 | | | | |
| South Central Coast | Ventura County APCD | Ventura | 335 | 0.200 | 2.512 | 0.207 | 435 | 0.387 | 4.806 | 0.374 |
| South Coast | South Coast AQMD | Los Angeles | 54 | 0.032 | 0.474 | 0.034 | | | | |
| South Coast | South Coast AQMD | Orange | 28 | 0.017 | 0.249 | 0.018 | | | | |
| South Coast | South Coast AQMD | Riverside | 139 | 0.087 | 1.215 | 0.087 | | | | |
| South Coast | South Coast AQMD | San Bernardino | 36 | 0.024 | 0.304 | 0.022 | 257 | 0.161 | 2.241 | 0.160 |
| | Grand Total (tons/day) | | 8212 | 4.654 | 48.886 | 3.678 | 8212 | 4.654 | 48.886 | 3.678 |

Table 2. Previous and Revised San Joaquin Valley Agricultural Irrigation Pump Emission Inventories

| | | Summer Emissions[3] (tons per day) | | |
|---|---|---|---|---|
| Estimate | Population | ROG | NOx | PM |
| Previous[1] | 2830 | 2.05 | 29.97 | 2.70 |
| Revised[2] | 4500 | 2.80 | 28.47 | 2.18 |

[1]Based on 1996 report prepared for the SJVUAPCD by Sonoma Technology, Inc.
[2]2003 estimate developed by SJVUAPCD and ARB staff based on Carl Moyer Program applications and 1996 STI report
[3]Summer emissions calculated based on STI survey data indicating 67% of ag irrigation pump usage occurs in summer months.

# Appendix E

## Stationary Diesel-Fueled Engines Health Risk Assessment Methodology

## Introduction

This appendix presents the methodology used to estimate the potential cancer risk from exposure to diesel particulate matter (PM) emitted from diesel-fuel stationary engines. The methodology was developed to assist in development of the *Stationary Diesel-Fueled Engine Airborne Toxic Control Measure (ATCM).*

The estimated risks and assumptions used to determine these risks are not based on a specific engine location or operating parameters. Instead, general assumptions bracketing a fairly broad range of possible operating scenarios were used.

Exposures were estimated at varying downwind distances, including the "point of maximum impact" (PMI) as determined using air dispersion modeling. The estimated risk ranges are used to provide a "qualitative" assessment of the potential risk levels near operating stationary diesel-fueled engines. Actual risk levels will vary due to site specific parameters, including horsepower rating and configuration of the engine, emission rates, operating schedules, site configuration, site meteorology, and distance to receptors.

## Source Description

The following methodology was developed to provide estimates of the potential cancer risk associated with exposures to diesel PM emissions from stationary diesel-fueled engines.

Stationary diesel-fueled engines are generally categorized as either prime engines or emergency back-up engines. Prime engines are used to power equipment such as compressors, cranes, generators, pumps, and grinders. Emergency back-up engines are used solely for emergency back-up electric power generation or water pumping. The main difference between prime and emergency back-up engines is that prime engines usually operate considerably more hours per year.

The methodology used in this risk assessment is consistent with the Tier-1 analysis presented in the draft Office of Environmental Health Hazard Assessment (OEHHA), Air Toxics Hot Spots Program Risk Assessment Guidelines: The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (OEHHA, 2002a). The OEHHA draft guidelines and this assessment utilize health and exposure assessment information that is contained in the Air Toxics Hot Spot Program Risk Assessment Guidelines, Part II, Technical Support Document for Describing Available Cancer Potency Factors (OEHHA 2002b); and the Air Toxics Hot Spot Program Risk Assessment Guidelines, Part IV, Technical Support Document for Exposure Analysis and Stochastic Analysis (OEHHA 2000), respectively.

## Modeling Assumptions

For this modeling exercise we used a matrix of parameters. We modeled engines of 200, 550, and 1500 horsepower, and varied both the emissions rate and the hours of operation for each horsepower rating. For each engine horsepower, we modeled five diesel PM emission factors: 0.01, 0.15, 0.40, 0.55, and 1.0 grams/brake hp-hour. We also varied the hours of operation and evaluated the risks for the following hours of operation: 10, 20, 30, 40, 50, 100, 200, 300, 400, 500, and 1000 hours/year. For each case we calculated the risk at varying downwind distances.

**Model Used**

The PM emissions are modeled in this scenario using the United States Environmental Protection Agency's Industrial Source Complex Short Term Model – Version 3 (ISCST3 Date: 00101). The ISCST3 is an air dispersion model that allows an estimation of the annual average above ambient diesel PM concentrations.[1] The potential cancer risk to nearby residential receptors is obtained by multiplying annual average above ambient concentration of diesel PM by the unit risk factor (URF) for diesel PM (300 excess cancers/ug/$m^3$ over a 70-year exposure period). The results are expressed as an estimate of potential cancer risk in chances per million.

**Meteorological Data**

Meteorological data are site-specific parameters that are used in air dispersion models to calculate concentrations of emissions and subsequent risk. For this scenario, West Los Angeles, 1981, meteorological data were selected as the input to the ISCST3 model. The West Los Angeles meteorological data tend to provide higher estimates of risk than most of the other meteorological data sets compiled by ARB. This is because the West Los Angeles site tends to have the lowest average wind speed and more persistent wind directions, which result in less dispersion of pollutants.

**Model Parameters and Emission Factors**

The key modeling parameters and emission factors are presented in Table 1. We used the rural dispersion coefficient to provide a more conservative (higher) estimate of the predicted concentration and the estimated potential cancer risk.

[1]The pollutant concentrations obtained from this modeling exercise that are used to estimate cancer risk do not include the background (or ambient) levels of the modeled pollutant. The final risk value is determined by multiplying the modeled pollutant concentration by the Unit Risk Factor (URF), as determined by ARB and the Office of Environmental Health Hazard Assessment (OEHHA).

## Table 1: Modeling and Health Risk Assessment Parameters

| | |
|---|---|
| **Modeling Paramenters** | |
| Model | ISCST3 (Version 00101) |
| Engine Horsepower (at 100% load) | 200 HP, 550 HP, 1500 HP |
| Engine Operation Load | 75% |
| Emission Factor | 0.01, 0.15, 0.40, 0.55, 1.00 g/bhp-hr |
| Operation Hours (annual) | 10, 20, 30, 40, 50, 100, 200, 300, 400, 500, 1000 |
| Source Type | Point |
| Dispersion Setting | Rural |
| Receptor Height | 1.5 m |
| Stack Information: | |
| Stack Diameter | 4 in, 6 in, and 13 in |
| Stack Height | 3 m |
| Stack Temperature | 622 K |
| Stack Exhaust Velocity | 59.8 m/s, 73.1 m/s, and 42.5 m/s |
| Time Emissions Emitted | 3 p.m. |
| Meteorological Data | West L. A. (1981) |
| Release Height | Same as the stack height |
| **Health Risk Assessment Parameters** | |
| Receptor's Hypothetical Exposure Time | 70 years, 50 weeks per year |
| Adult Daily Breathing Rate Range | 271 - 393 l/kg body weight -day [1] |
| Adult Body Weight | 70 kg |
| Diesel PM Unit Risk Factor | 300 excess cancers/$\mu g/m^3$ |

1. The low end of the breathing rate range is the mean of the OEHHA breathing rate distribution and the high end is the 95$^{th}$ percentile of the distribution

## Results

We have included three sets of tables, one set for each modeled horsepower (200, 500, and 1500). Each set of tables contains five sub-tables, one for each emission factor (0.01, 0.15, 0.40, 0.55 and 1.0 g/bhp-hr). Each emission factor table comprises a matrix of downwind distances and hours of operation, with the calculated risks for each combination. The low-end and high-end of the risks presented in the tables are corresponding to the 65$^{th}$ (mean) and 95$^{th}$ percentile breathing rates, respectively. Additionally, the tables are coded using varied levels of shading. The moderately shaded squares denote the low-end potential cancer risks of between one and ten per one million people. The darkest squares show the low-end risk levels between 11 and 100 potential cancer cases per million. The white squares show the highest calculated risks, those exceeding 100 potential cases per million people. As can be seen, the estimated cancer risk from stationary diesel-fueled engines varies depending on the emission rate, horsepower and annual hours of operation for a given engine.

*Estimated risk as a function of emission factor:*

For the range of engine horsepowers modeled, all those engines that emitted 0.01 g/bhp-hr or less could run at least 1000 hours per year without exceeding the lowest range of estimated risks, those of 10 or less potential cancer cases per year.

For the 0.15 g/ bhp-hr engines, most combinations of horsepower, hours of operation and downwind distance did not exceed the lowest range of risks, with those combinations resulting in the higher risk ranges occurring at 200-plus operating hours and low to moderate downwind distances.

For engines with emissions of 0.4 g/bhp-hr or more the trend was to find higher risks at low to moderate downwind distances and longer operating times continues, with the proportion of moderate to high risk level results increasing as emission factors increase.

*Estimated risk as a function of hours of operation:*

Generally, as the hours of operation increased, the number of engines that exceeded the lowest risk range increased. However, most engines could operate for 10 to 20 hours per year without exceeding the lowest range of risk.

*Estimated risk as a function of horsepower:*

For the engine configurations evaluated in these scenarios, the smaller horsepower engine (200 hp), typically demonstrated higher near source risk for a given number of hours of operation than the larger engines. In addition, the potential cancer risk reached the point of maximum impact more rapidly for the 200 hp engine than the larger engines. The larger engines had the point of maximum impact further from the engine due to the greater plume dispersion that occurs with the large horsepower engines.

## Table Set 1: Diesel Exhaust PM Risk (Potential Cancer Cases in A Million) for 200 HP Engines

| | EF = 0.01 g/bhp-hr | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downwind Distance (m) | | | | | | | | | | |
| Hours | 30 | 42 | 75 | 100 | 200 | 300 | 400 | 500 | 800 | 1600 | 3200 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 50 | 0 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200 | 1-2 | 1-2 | 1-1 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 300 | 2-2 | 2-3 | 1-2 | 1-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 400 | 2-3 | 3-4 | 2-2 | 1-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 500 | 3-4 | 4-5 | 2-3 | 1-2 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1000 | 6-8 | 7-10 | 4-5 | 2-3 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 | 0 |

| | EF = 0.15 g/bhp-hr | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downwind Distance (m) | | | | | | | | | | |
| Hours | 30 | 42 | 75 | 100 | 200 | 300 | 400 | 500 | 800 | 1600 | 3200 |
| 10 | 1-1 | 1-2 | 1-1 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 2-2 | 2-3 | 1-2 | 1-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 3-4 | 3-5 | 2-2 | 1-2 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40 | 3-5 | 4-6 | 2-3 | 1-2 | 1-1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 50 | 4-6 | 5-8 | 3-4 | 2-3 | 1-1 | 0-1 | 0 | 0 | 0 | 0 | 0 |
| 100 | 8-12 | 11-16 | 6-8 | 4-5 | 1-2 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 |
| 200 | 17-24 | 21-31 | 11-16 | 7-10 | 3-4 | 2-2 | 1-2 | 1-1 | 0-1 | 0 | 0 |
| 300 | 25-36 | 32-46 | 17-25 | 11-16 | 4-6 | 2-3 | 2-2 | 1-2 | 1-1 | 0-1 | 0 |
| 400 | 33-49 | 42-61 | 23-33 | 14-20 | 6-7 | 3-4 | 2-3 | 2-2 | 1-1 | 0-1 | 0 |
| 500 | 42-61 | 53-76 | 28-41 | 18-26 | 6-9 | 4-6 | 3-4 | 2-3 | 1-2 | 1-1 | 0 |
| 1000 | 84-122 | 105-153 | 56-82 | 35-51 | 15-18 | 8-11 | 5-8 | 4-6 | 2-4 | 1-2 | 1-1 |

| | EF = 0.40 g/bhp-hr | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downwind Distance (m) | | | | | | | | | | |
| Hours | 30 | 42 | 75 | 100 | 200 | 300 | 400 | 500 | 800 | 1600 | 3200 |
| 10 | 2-3 | 3-4 | 2-2 | 1-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 4-6 | 6-8 | 3-4 | 2-3 | 1-1 | 0-1 | 0 | 0 | 0 | 0 | 0 |
| 30 | 7-10 | 8-12 | 5-7 | 3-4 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 | 0 |
| 40 | 9-13 | 11-16 | 6-9 | 4-5 | 1-2 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 |
| 50 | 11-16 | 14-20 | 8-11 | 5-7 | 2-2 | 1-1 | 1-1 | 1-1 | 0 | 0 | 0 |
| 100 | 22-32 | 28-41 | 15-22 | 9-14 | 3-5 | 2-3 | 1-2 | 1-2 | 1-1 | 0 | 0 |
| 200 | 45-65 | 56-81 | 30-44 | 19-27 | 7-10 | 4-6 | 3-4 | 2-3 | 1-2 | 1-1 | 0 |
| 300 | 67-97 | 84-122 | 45-65 | 28-41 | 10-15 | 6-9 | 4-6 | 3-5 | 2-3 | 1-1 | 0-1 |
| 400 | 89-130 | 112-163 | 60-87 | 38-55 | 14-20 | 8-12 | 6-8 | 4-6 | 3-4 | 1-2 | 1-1 |
| 500 | 112-162 | 140-203 | 75-109 | 47-68 | 17-25 | 10-15 | 7-10 | 6-8 | 3-5 | 2-2 | 1-1 |
| 1000 | 223-324 | 280-407 | 150-218 | 94-137 | 34-49 | 20-29 | 14-21 | 11-16 | 7-10 | 3-5 | 2-2 |

| | EF = 0.55 g/bhp-hr | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downwind Distance (m) | | | | | | | | | | |
| Hours | 30 | 42 | 75 | 100 | 200 | 300 | 400 | 500 | 800 | 1600 | 3200 |
| 10 | 3-4 | 4-6 | 2-3 | 1-2 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 6-9 | 8-11 | 4-6 | 3-4 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 | 0 |
| 30 | 9-13 | 12-17 | 6-9 | 4-6 | 1-2 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 |
| 40 | 12-16 | 15-22 | 8-12 | 5-8 | 2-3 | 1-2 | 1-1 | 1-1 | 0-1 | 0 | 0 |
| 50 | 15-22 | 19-28 | 10-15 | 6-9 | 2-3 | 1-2 | 1-1 | 1-1 | 0-1 | 0 | 0 |
| 100 | 31-45 | 39-56 | 21-30 | 13-19 | 5-7 | 3-4 | 2-3 | 2-2 | 1-1 | 0-1 | 0 |
| 200 | 61-89 | 77-112 | 41-60 | 26-38 | 9-14 | 6-8 | 4-6 | 3-4 | 2-3 | 1-1 | 0-1 |
| 300 | 92-134 | 116-168 | 62-90 | 39-56 | 14-20 | 8-12 | 6-9 | 5-7 | 3-4 | 1-2 | 1-1 |
| 400 | 123-178 | 154-224 | 83-120 | 52-75 | 19-27 | 11-16 | 8-11 | 6-9 | 4-5 | 2-3 | 1-1 |
| 500 | 153-223 | 193-280 | 103-150 | 65-94 | 23-34 | 14-20 | 10-14 | 8-11 | 5-7 | 2-3 | 1-2 |
| 1000 | 307-446 | 385-559 | 206-300 | 129-188 | 47-68 | 28-40 | 20-29 | 15-22 | 9-13 | 4-6 | 2-3 |

| | EF = 1.0 g/bhp-hr | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downwind Distance (m) | | | | | | | | | | |
| Hours | 30 | 42 | 75 | 100 | 200 | 300 | 400 | 500 | 800 | 1600 | 3200 |
| 10 | 6-8 | 7-10 | 4-5 | 2-3 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 | 0 |
| 20 | 11-16 | 14-20 | 8-11 | 5-7 | 2-2 | 1-1 | 1-1 | 1-1 | 0 | 0 | 0 |
| 30 | 17-24 | 21-31 | 11-16 | 7-10 | 3-4 | 2-2 | 1-2 | 1-1 | 0-1 | 0 | 0 |
| 40 | 22-32 | 28-41 | 15-22 | 9-14 | 3-5 | 2-3 | 1-2 | 1-2 | 1-1 | 0 | 0 |
| 50 | 28-41 | 36-51 | 19-27 | 12-17 | 4-6 | 3-4 | 2-3 | 1-2 | 1-1 | 0-1 | 0 |
| 100 | 56-81 | 70-102 | 38-55 | 23-34 | 8-12 | 5-7 | 4-5 | 3-4 | 2-2 | 1-1 | 0-1 |
| 200 | 112-162 | 140-203 | 75-109 | 47-68 | 17-25 | 10-15 | 7-10 | 6-8 | 3-5 | 2-2 | 1-1 |
| 300 | 167-243 | 210-305 | 113-164 | 70-102 | 25-37 | 15-22 | 11-16 | 8-12 | 5-7 | 2-3 | 1-2 |
| 400 | 223-324 | 280-407 | 150-218 | 94-137 | 34-49 | 20-29 | 14-21 | 11-16 | 7-10 | 3-5 | 2-2 |
| 500 | 279-405 | 350-508 | 188-273 | 117-171 | 42-62 | 25-37 | 18-26 | 14-20 | 8-12 | 4-6 | 2-3 |
| 1000 | 558-810 | 700-1017 | 375-545 | 235-341 | 85-123 | 50-73 | 36-52 | 26-40 | 16-24 | 8-11 | 4-6 |

Note:

1. The low-end risk is based on the mean breathing rate and high-end risk is based on the 95th percentile breathing rate. These risk values assume an exposure duration of 70 years for nearby residents;
2. Light Shading shows the potential cancer risk >= 10/million; Dark Shading shows the risk betwee 10 and 100 per million; No Shading shows the risk greater than 100 per million.

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## Table Set 2: Diesel Exhaust PM Risk (Potential Cancer Cases In A Million) for 550 HP Engines

| | EF = 0.01 g/bhp-hr Downwind Distance (m) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hours | 30 | 50 | 70 | 100 | 200 | 300 | 400 | 500 | 800 | 1600 | 3200 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 50 | 0 | 0 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100 | 0 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200 | 0 | 1-1 | 1-1 | 1-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 300 | 1-1 | 1-1 | 1-2 | 1-1 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 400 | 1-1 | 1-2 | 2-2 | 1-2 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 500 | 1-1 | 2-2 | 2-3 | 2-2 | 1-1 | 0 | 0 | | 0 | 0 | 0 |
| 1000 | 2-2 | 3-5 | 4-6 | 3-5 | 1-2 | 1-1 | 0-1 | 0-1 | 0 | 0 | 0 |

| | EF = 0.15 g/bhp-hr Downwind Distance (m) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hours | 30 | 50 | 70 | 100 | 200 | 300 | 400 | 500 | 800 | 1600 | 3200 |
| 10 | 0 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 1-1 | 1-1 | 1-2 | 1-1 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 1-1 | 2-2 | 2-3 | 1-2 | 1-1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40 | 1-1 | 2-3 | 2-4 | 2-3 | 1-1 | 0-1 | 0 | 0 | 0 | 0 | 0 |
| 50 | 1-2 | 3-4 | 3-4 | 2-4 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 | 0 |
| 100 | 3-4 | 5-7 | 6-9 | 5-7 | 2-3 | 1-1 | 1-1 | 1-1 | 0 | 0 | 0 |
| 200 | 5-7 | 10-15 | 12-18 | 10-14 | 4-5 | 2-3 | 1-2 | 1-2 | 1-1 | 0 | 0 |
| 300 | 8-11 | 15-22 | 18-27 | 14-21 | 5-8 | 3-4 | 2-3 | 2-2 | 1-1 | 0-1 | 0 |
| 400 | 10-15 | 20-30 | 25-36 | 19-28 | 7-10 | 4-6 | 3-4 | 2-3 | 1-2 | 1-1 | 0 |
| 500 | 13-18 | 25-37 | 31-45 | 24-35 | 9-13 | 5-7 | 4-5 | 3-4 | 2-2 | 1-1 | 0-1 |
| 1000 | 25-37 | 51-74 | 61-88 | 48-70 | 18-26 | 10-15 | 7-10 | 5-8 | 3-5 | 1-2 | 1-1 |

| | EF = 0.40 g/bhp-hr Downwind Distance (m) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hours | 30 | 50 | 70 | 100 | 200 | 300 | 400 | 500 | 800 | 1600 | 3200 |
| 10 | 1-1 | 1-2 | 2-2 | 1-2 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 1-2 | 3-4 | 3-5 | 3-4 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 | 0 |
| 30 | 2-3 | 4-6 | 5-7 | 4-6 | 1-2 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 |
| 40 | 3-4 | 5-8 | 7-9 | 5-7 | 2-3 | 1-2 | 1-1 | 1-1 | 0 | 0 | 0 |
| 50 | 3-5 | 7-10 | 8-12 | 6-9 | 2-3 | 1-2 | 1-1 | 1-1 | 0-1 | 0 | 0 |
| 100 | 7-10 | 14-20 | 16-24 | 13-19 | 5-7 | 3-4 | 2-3 | 1-2 | 1-1 | 0-1 | 0 |
| 200 | 14-20 | 27-40 | 33-47 | 26-37 | 10-14 | 6-8 | 4-5 | 3-4 | 2-2 | 1-1 | 0-1 |
| 300 | 20-29 | 41-59 | 49-71 | 39-56 | 14-21 | 8-12 | 6-8 | 4-6 | 2-4 | 1-2 | 1-1 |
| 400 | 27-39 | 54-79 | 65-95 | 52-75 | 19-28 | 11-16 | 8-11 | 6-8 | 3-5 | 2-2 | 1-1 |
| 500 | 34-49 | 68-99 | 82-119 | 64-94 | 24-35 | 14-20 | 9-14 | 7-10 | 4-6 | 2-3 | 1-1 |
| 1000 | 68-98 | 136-198 | 163-237 | 129-187 | 48-70 | 27-40 | 19-27 | 14-21 | 8-12 | 4-6 | 2-3 |

| | EF = 0.55 g/bhp-hr Downwind Distance (m) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hours | 30 | 50 | 70 | 100 | 200 | 300 | 400 | 500 | 800 | 1600 | 3200 |
| 10 | 1-1 | 2-3 | 2-3 | 2-3 | 1-1 | 0-1 | 0 | 0 | 0 | 0 | 0 |
| 20 | 2-3 | 4-5 | 4-7 | 4-5 | 1-2 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 |
| 30 | 3-4 | 6-8 | 7-10 | 5-8 | 2-3 | 1-2 | 1-1 | 1-1 | 0 | 0 | 0 |
| 40 | 4-5 | 7-11 | 9-13 | 7-10 | 3-4 | 2-2 | 1-2 | 1-1 | 0-1 | 0 | 0 |
| 50 | 5-7 | 9-14 | 11-16 | 9-13 | 3-5 | 2-3 | 1-2 | 1-1 | 1-1 | 0 | 0 |
| 100 | 9-14 | 19-27 | 22-33 | 18-26 | 7-10 | 4-5 | 3-4 | 2-3 | 1-2 | 1-1 | 0 |
| 200 | 19-27 | 37-54 | 45-65 | 35-51 | 13-19 | 8-11 | 5-8 | 4-6 | 2-3 | 1-2 | 1-1 |
| 300 | 28-41 | 56-81 | 67-98 | 53-77 | 20-29 | 11-16 | 8-11 | 6-9 | 3-5 | 2-2 | 1-1 |
| 400 | 37-54 | 75-109 | 90-131 | 71-103 | 26-38 | 15-22 | 10-15 | 8-11 | 5-7 | 2-3 | 1-2 |
| 500 | 46-68 | 93-136 | 112-163 | 89-129 | 33-48 | 19-27 | 13-19 | 10-14 | 6-8 | 3-4 | 1-2 |
| 1000 | 93-135 | 187-272 | 225-326 | 177-257 | 66-96 | 38-55 | 26-38 | 20-29 | 11-17 | 5-8 | 3-4 |

| | EF = 1.0 g/bhp-hr Downwind Distance (m) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hours | 30 | 50 | 70 | 100 | 200 | 300 | 400 | 500 | 800 | 1600 | 3200 |
| 10 | 2-2 | 3-5 | 4-6 | 3-5 | 1-2 | 1-1 | 0-1 | 0-1 | 0 | 0 | 0 |
| 20 | 3-5 | 7-10 | 8-12 | 6-9 | 2-3 | 1-2 | 1-1 | 1-1 | 0-1 | 0 | 0 |
| 30 | 5-7 | 10-15 | 12-18 | 10-14 | 4-5 | 2-3 | 1-2 | 1-2 | 1-1 | 0 | 0 |
| 40 | 7-10 | 14-20 | 16-24 | 13-19 | 6-7 | 3-4 | 2-3 | 1-2 | 1-1 | 0-1 | 0 |
| 50 | 8-12 | 17-25 | 20-30 | 16-23 | 6-9 | 3-5 | 2-3 | 2-3 | 1-2 | 0-1 | 0 |
| 100 | 17-25 | 34-49 | 41-59 | 32-47 | 12-17 | 7-10 | 5-7 | 4-5 | 2-3 | 1-1 | 0-1 |
| 200 | 34-49 | 68-99 | 82-119 | 64-94 | 24-35 | 14-20 | 9-14 | 7-10 | 4-6 | 2-3 | 1-1 |
| 300 | 51-74 | 102-148 | 123-178 | 97-140 | 36-52 | 21-30 | 14-21 | 11-16 | 6-9 | 3-4 | 1-2 |
| 400 | 68-98 | 136-198 | 163-237 | 129-187 | 48-70 | 27-40 | 19-27 | 14-21 | 8-12 | 4-6 | 2-3 |
| 500 | 85-123 | 170-247 | 204-297 | 161-234 | 60-87 | 34-50 | 24-34 | 18-26 | 10-15 | 5-7 | 2-3 |
| 1000 | 169-246 | 340-494 | 409-593 | 322-468 | 120-175 | 68-99 | 47-68 | 36-52 | 21-30 | 10-14 | 5-7 |

Note:

1. The low-end risk is based on the mean breathing rate and high-end risk is based on the 95th percentile breathing rate. These risk values assume an exposure duration of 70 years for nearby residents;
2. Light Shading shows the potential cancer risk >= 10/million; Dark Shading shows the risk betwee 10 and 100 per million; No Shading shows the risk greater than 100 per million.

## Table Set 3: Diesel Exhaust PM Risk (Potential Cancer Cases in A Million) for 1500 HP Engines

| | EF = 0.01 g/bhp-hr | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downwind Distance (m) | | | | | | | | | | |
| Hours | 30 | 50 | 100 | 132 | 200 | 300 | 400 | 500 | 800 | 1600 | 3200 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100 | 0 | 0 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200 | 0 | 0 | 1-1 | 1-1 | 1-1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 300 | 0 | 0 | 1-2 | 1-2 | 1-1 | 0-1 | 0 | 0 | 0 | 0 | 0 |
| 400 | 0 | 0-1 | 1-2 | 2-2 | 1-2 | 1-1 | 0-1 | 0 | 0 | 0 | 0 |
| 500 | 0 | 1-1 | 2-3 | 2-3 | 1-2 | 1-1 | 0-1 | 0 | 0 | 0 | 0 |
| 1000 | 1-1 | 1-2 | 4-5 | 4-6 | 3-4 | 1-2 | 1-1 | 1-1 | 0 | 0 | 0 |

| | EF = 0.15 g/bhp-hr | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downwind Distance (m) | | | | | | | | | | |
| Hours | 30 | 50 | 100 | 132 | 200 | 300 | 400 | 500 | 800 | 1600 | 3200 |
| 10 | 0 | 0 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 0 | 0 | 1-2 | 1-2 | 1-1 | 0-1 | 0 | 0 | 0 | 0 | 0 |
| 30 | 0 | 0-1 | 2-2 | 2-3 | 1-2 | 1-1 | 0-1 | 0 | 0 | 0 | 0 |
| 40 | 0 | 1-1 | 2-3 | 3-4 | 2-2 | 1-1 | 1-1 | 0-1 | 0 | 0 | 0 |
| 50 | 0-1 | 1-1 | 3-4 | 3-5 | 2-3 | 1-2 | 1-1 | 0-1 | 0 | 0 | 0 |
| 100 | 1-1 | 2-2 | 5-8 | 6-9 | 4-6 | 2-3 | 1-2 | 1-1 | 0-1 | 0 | 0 |
| 200 | 2-2 | 3-5 | 11-16 | 13-19 | 9-12 | 4-6 | 3-4 | 2-3 | 1-1 | 0-1 | 0 |
| 300 | 2-3 | 5-7 | 16-23 | 19-28 | 13-19 | 6-9 | 4-6 | 3-4 | 1-2 | 1-1 | 0 |
| 400 | 3-4 | 7-10 | 21-31 | 26-37 | 17-25 | 9-12 | 5-8 | 4-5 | 2-3 | 1-1 | 0-1 |
| 500 | 4-6 | 8-12 | 26-38 | 32-47 | 21-31 | 11-16 | 7-10 | 5-7 | 2-4 | 1-2 | 1-1 |
| 1000 | 8-11 | 17-24 | 53-77 | 64-93 | 43-62 | 21-31 | 13-19 | 9-14 | 5-7 | 2-3 | 1-1 |

| | EF = 0.40 g/bhp-hr | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downwind Distance (m) | | | | | | | | | | |
| Hours | 30 | 50 | 100 | 132 | 200 | 300 | 400 | 500 | 800 | 1600 | 3200 |
| 10 | 0 | 0-1 | 1-2 | 2-2 | 1-2 | 1-1 | 0-1 | 0 | 0 | 0 | 0 |
| 20 | 0-1 | 1-1 | 3-4 | 3-5 | 2-3 | 1-2 | 1-1 | 1-1 | 0 | 0 | 0 |
| 30 | 1-1 | 1-2 | 4-6 | 5-7 | 3-5 | 2-2 | 1-2 | 1-1 | 0-1 | 0 | 0 |
| 40 | 1-1 | 2-3 | 6-8 | 7-10 | 5-7 | 2-3 | 1-2 | 1-1 | 1-1 | 0 | 0 |
| 50 | 1-1 | 2-3 | 7-10 | 9-12 | 6-8 | 3-4 | 2-3 | 1-2 | 1-1 | 0 | 0 |
| 100 | 2-3 | 4-6 | 14-20 | 17-25 | 11-16 | 6-8 | 4-5 | 3-4 | 1-2 | 1-1 | 0 |
| 200 | 4-6 | 9-13 | 28-41 | 34-50 | 23-33 | 11-16 | 7-10 | 5-7 | 3-4 | 1-2 | 1-1 |
| 300 | 6-9 | 13-19 | 42-61 | 51-75 | 34-50 | 17-25 | 11-15 | 8-11 | 4-6 | 2-3 | 1-1 |
| 400 | 8-12 | 18-26 | 56-82 | 68-99 | 46-67 | 23-33 | 14-21 | 10-15 | 5-8 | 2-3 | 1-2 |
| 500 | 10-15 | 22-32 | 70-102 | 86-124 | 57-83 | 28-41 | 18-26 | 13-18 | 7-10 | 3-4 | 1-2 |
| 1000 | 20-30 | 44-64 | 141-204 | 171-249 | 114-166 | 57-83 | 35-51 | 25-37 | 13-19 | 6-8 | 3-4 |

| | EF = 0.55 g/bhp-hr | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downwind Distance (m) | | | | | | | | | | |
| Hours | 30 | 50 | 100 | 132 | 200 | 300 | 400 | 500 | 800 | 1600 | 3200 |
| 10 | 0 | 1-1 | 2-3 | 2-3 | 2-2 | 1-1 | 0-1 | 0-1 | 0 | 0 | 0 |
| 20 | 1-1 | 1-2 | 4-6 | 5-7 | 3-5 | 2-2 | 1-1 | 1-1 | 0-1 | 0 | 0 |
| 30 | 1-1 | 2-3 | 6-8 | 7-10 | 5-7 | 2-3 | 1-2 | 1-2 | 1-1 | 0 | 0 |
| 40 | 1-2 | 2-4 | 8-11 | 9-14 | 6-9 | 3-5 | 2-3 | 1-2 | 1-1 | 0 | 0 |
| 50 | 1-2 | 3-4 | 10-14 | 12-17 | 8-11 | 4-6 | 2-4 | 2-3 | 1-1 | 0-1 | 0 |
| 100 | 3-4 | 6-9 | 19-28 | 24-34 | 16-23 | 8-11 | 5-7 | 3-5 | 2-3 | 1-1 | 0-1 |
| 200 | 6-8 | 12-18 | 39-56 | 47-68 | 31-46 | 16-23 | 10-14 | 7-10 | 4-5 | 2-2 | 1-1 |
| 300 | 8-12 | 18-27 | 58-84 | 71-103 | 47-69 | 23-34 | 15-21 | 10-15 | 5-8 | 2-3 | 1-2 |
| 400 | 11-16 | 24-35 | 77-112 | 94-137 | 63-91 | 31-46 | 19-28 | 14-20 | 7-11 | 3-5 | 1-2 |
| 500 | 14-20 | 30-44 | 97-140 | 118-171 | 79-114 | 39-57 | 24-35 | 17-26 | 9-13 | 4-6 | 2-3 |
| 1000 | 28-41 | 61-89 | 193-281 | 235-342 | 157-229 | 78-114 | 49-71 | 35-50 | 18-26 | 8-11 | 4-5 |

| | EF = 1.0 g/bhp-hr | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downwind Distance (m) | | | | | | | | | | |
| Hours | 30 | 50 | 100 | 132 | 200 | 300 | 400 | 500 | 800 | 1600 | 3200 |
| 10 | 1-1 | 1-2 | 4-5 | 4-6 | 3-4 | 1-2 | 1-1 | 1-1 | 0 | 0 | 0 |
| 20 | 1-1 | 2-3 | 7-10 | 9-12 | 6-8 | 3-4 | 2-3 | 1-2 | 1-1 | 0 | 0 |
| 30 | 2-2 | 3-5 | 11-16 | 13-19 | 9-12 | 4-6 | 3-4 | 2-3 | 1-1 | 0-1 | 0 |
| 40 | 2-3 | 4-6 | 14-20 | 17-25 | 11-16 | 6-8 | 4-5 | 3-4 | 1-2 | 1-1 | 0 |
| 50 | 3-4 | 6-8 | 18-26 | 21-31 | 14-21 | 7-10 | 4-6 | 3-5 | 2-2 | 1-1 | 0 |
| 100 | 5-7 | 11-16 | 35-51 | 43-62 | 29-42 | 14-21 | 9-13 | 6-9 | 3-5 | 1-2 | 1-1 |
| 200 | 10-15 | 22-32 | 70-102 | 86-124 | 57-83 | 28-41 | 18-26 | 13-18 | 7-10 | 3-4 | 1-2 |
| 300 | 15-22 | 33-48 | 106-153 | 128-186 | 86-125 | 43-62 | 27-39 | 19-27 | 10-14 | 4-6 | 2-3 |
| 400 | 20-30 | 44-64 | 141-204 | 171-249 | 114-166 | 57-83 | 35-51 | 25-37 | 13-19 | 6-8 | 3-4 |
| 500 | 25-37 | 55-80 | 176-255 | 214-311 | 143-208 | 71-103 | 44-64 | 32-46 | 17-24 | 7-10 | 3-5 |
| 1000 | 51-74 | 111-161 | 352-511 | 428-622 | 286-416 | 142-206 | 88-128 | 63-92 | 33-48 | 14-20 | 7-10 |

Note:

1. The low-end risk is based on the mean breathing rate and high-end risk is based on the 95th percentile breathing rate. These risk values assume an exposure duration of 70 years for nearby residents;
2. Light Shading shows the potential cancer risk <= 10/million; Dark Shading shows the risk betwee 10 and 100 per million; No Shading shows the risk greater than 100 per million.

**REFERENCES:**

Office of Environmental Health Hazard Assessment. *Air Toxics Hot Spots Program Risk Assessment Guidelines: The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*; 2002. (OEHHA, 2002a)

Office of Environmental Health Hazard Assessment. *Air Toxics Hot Spots Program Risk Assessment Guidelines, Part II, Technical Support Document for Describing Available Cancer Potency Factors*; 2002. (OEHHA, 2002b)

Office of Environmental Health Hazard Assessment. *Air Toxics Hot Spots Program Risk Assessment Guidelines, Part IV, Technical Support Document for Exposure Analysis and Stochastic Analysis*; 2000. (OEHHA, 2000)

# Appendix F

# Basis for the Diesel PM Standards

**Introduction**

This appendix presents the basis for the diesel particulate matter (PM) limits established in the proposed *Stationary Diesel-Fueled Engine Airborne Toxic Control Measure* (ATCM).

The diesel PM emission limits established for engines greater than 50 horsepower are summarized in Table F-1. The diesel PM emission limit for engines less than or equal to 50 hp is equal to the applicable Off-Road Compression-Ignition Engine Standards (Title 13, CCR, section 2423). Altogether, there are six different diesel PM limits established by the ATCM. Each limit represents the application of what ARB staff considers the best available control technology (BACT) for a specific category of engine and engine use. Factors that influence what "best available control technology" means for a specific category and use of engine include potential near source risk, cost of controls, the availability of control technologies that can be used to meet these limits, and the availability of new engines that can meet these limits. The following paragraphs explain ARB staff's rationale for establishing these each of these limits.

**Table F-1: Diesel PM Limits for Engines Greater than 50 Horsepower**

| Diesel PM Emission Limit | Applicability | | | | | | Comments/Notes |
|---|---|---|---|---|---|---|---|
| | Prime | | E/S | | Agricultural | | |
| | New | In-Use | New | In-Use | New | In-Use | |
| None | | | | X | | | • For E/S: Annual maintenance and testing hours limited to 20 or less |
| ≤0.40 | | | | X | | | • For E/S: Annual maintenance and testing hours limited to 30 or less |
| ≤0.15 | | | X | X | X | | • For E/S: Annual maintenance and testing hours limited to 50 or less |
| ≤0.01 | X | X | X | X | | | • For E/S: Annual maintenance and testing hours limited to 100 or less |
| 30% reduction from baseline levels | | X | | | | | • For Prime: Must meet 0.01 g/bhp-hr by 2011 |
| 85% reduction from baseline levels | | X | | | | | |

**Diesel PM Limit: None (No diesel PM limit established)**

*To what engine applications does this diesel PM limit apply?*

In-use emergency standby engines that are operated less than or equal to 20 hours per year for maintenance and testing purposes.

*Why is this limit appropriate for these applications?*

For in-use engines, those that have been installed at a facility on or before January 1, 2005, the most cost effective approaches to reducing the risk to acceptable levels is to limit the hours of operation. ARB staff knows from reviewing air dispersion modeling (see Appendix E, Stationary Diesel-Fueled Engines, Health Risk Assessment Methodology) results that engine horsepower or size does not have as significant an impact on the maximum offsite risk as does diesel PM emission rate and hours of operation. Our modeling showed that most engines could operate for 10 to 20 hours per year without exceeding a potential cancer case threshold of 10 potential cancer cases per million.

The results from the ARB survey of emergency standby diesel-fueled CI engines in California indicate that on average a typical stationary engine operates approximately 20 hours per year for maintenance and testing, with 95 percent of the engines operating 50 hours or less for maintenance and testing purposes (See Appendix B, Stationary Emergency Standby Diesel-Fueled Engine Survey). From this data, ARB staff concludes that it is technically feasible to reduce hours of operation for maintenance and testing to below 20 hours per year. Results from that same survey indicate that on average an emergency standby engine operates 7 hours per year for emergency use, with over 80 percent of the engines operating 10 hours or less for emergency use. Therefore, ARB staff believes a limit on maintenance and testing hours of operation is appropriate because these hours of operation are planned hours of operation and represent the mode of operation where the most hours are accumulated. The owner or operator has control over how long these engines are run in this mode, while emergency use hours by definition are unplanned and are typically much less than the scheduled hours of operation for maintenance and testing.

**Diesel PM Limit: 0.40 g/bhp-hr**

*To what engine applications does this diesel PM limit apply?*

In-use emergency standby engines that are operated less than or equal to 30 hours per year for maintenance and testing purposes.

*Why is this limit appropriate for these applications?*

Although the reduction in planned hours of operation is the simplest and most cost effective way to reduce the risk in-use emergency standby engines, ARB staff recognizes that there may be specific applications that require more than 20 hours of operation per year for maintenance and testing. Therefore, ARB staff has established requirements that consist of both emission limits and limits on annual hours of operation. Our air dispersion modeling shows that most engines that emit diesel PM at an emission rate of 0.40 g/bhp-hr could operate for up to 30 hours per year without exceeding a potential cancer case threshold of about 10 potential cancer cases per million at the point of maximum impact.

As discussed in the previous subsection, ARB survey data indicates that is technically feasible for many owners to reduce their hours of operation for maintenance and testing to below 30 hours per year, and that a limit on maintenance and testing hours of operation is appropriate because these hours of operation are planned hours of operation and represent the mode of operation where the most hours are accumulated. The owner or operator has control over how long these engines are run in this mode, while emergency use hours by definition are unplanned and are typically much less than the scheduled hours of operation for maintenance and testing.

*Is the 0.40 g/bhp-hr diesel PM emission limit technologically achievable?*

The 0.40 g/bhp-hr is technologically achievable because:

- Off-road Certified Engines with horsepower ratings from 100 to 175 have been required to meet a 0.22 g/bhp-hr standard since 2003.
- Off-road Certified Engines with horsepower ratings from 175 to 750 have been required to meet a 0.40 g/bhp-hr standard since 1996.
- Off-road Certified Engines with horsepower ratings greater than 750 have been required to meet a 0.40 g/bhp-hr standard since 2000.
- Three pre-1996 model year engines were tested for diesel PM emission rate as part of the ARB/CE-CERT Diesel PM Control Technology Demonstration. All three engines emitted diesel PM at levels below 0.40 g/bhp-hr, the highest being 0.19 g/bhp-hr.
- Diesel PM emission test results from the ARB/CE-CERT Diesel PM Control Technology Demonstration (see appendix H, Control Technology Demonstration.) and independent testing have shown diesel oxidation catalyst (DOC) technology can reduce diesel PM emissions from 20 to 30 percent. A typical uncontrolled diesel-fueled engine currently operating in California emits between 0.50 and 0.60 g/bhp-hr of diesel PM. An engine with a baseline diesel PM emission rate of 0.55 would be able to meet the 0.40 g/bhp-hr standard if it installed a DOC with a reduction efficiency of 27 percent.

**Diesel PM Limit: 0.15 g/bhp-hr**

*To what engine applications does this diesel PM limit apply?*

- New and in-use emergency standby engines that are operated less than or equal to 50 hours per year for maintenance and testing purposes.
- New agricultural engines.

*Why is this limit appropriate for these applications?*

<u>New and In-Use Emergency Standby Engine Applications</u>

As discussed in the previous subsection, ARB staff's approach in defining BACT for in-use emergency standby engine applications has been to establish emission rate limits and planned hours of operation limits that, together, result in an acceptable level of risk. Our air dispersion modeling shows that most engines that emit diesel PM at an emission rate of 0.15 g/bhp-hr could operate for up to 50 hours per year without exceeding a potential cancer case threshold of 10 potential cancer cases per million. For all new emergency standby engines, those installed after January 1, 2005, the 0.15 g/bhp-hr standard is appropriate, because new engines meeting this standard are currently available "off-the-shelf".

As discussed in the previous subsection, ARB survey data indicates that is technically feasible for many owners to reduce their hours of operation for maintenance and testing to well below 50 hours per year, and that a limit on maintenance and testing hours of operation is appropriate because these hours of operation are planned hours of operation and represent the mode of operation where the most hours are accumulated. The owner or operator has control over how long these engines are run in this mode, while emergency use hours by definition are unplanned and are typically much less than the scheduled hours of operation for maintenance and testing.

<u>Agricultural Engines</u>

The proposed ATCM establishes performance standards for new agricultural engines similar to new emergency standby engines, but without hour of operation restrictions for agricultural engines that are used in as emergency standby engines. Both new emergency standby and new prime engines used in agricultural operations are required to meet the 0.15 g/bhp-hr diesel PM emission limit. The "cleanest" off-road certified engines currently produced meet the 0.15 g/bhp-hr diesel PM certification level. Requiring agricultural engines to meet more stringent standards would mean the application of retrofit technologies. At this time, ARB staff believes that it is not appropriate to require the application of diesel PM emission control retrofit technologies on new or in-use agricultural engines. The reasons for this include the current lack of off-the-shelf retrofit control technology kits that could easily be installed by individual farmers; implementation and enforcement constraints resulting from the current lack of permitting requirements for agricultural engines; and the potential for creating disincentives to replacing or discontinuing the use of older, dirtier engines

A major factor in staff's decision not to require retrofit controls for new or in-use agricultural engines is retrofit installation and availability issues. Engine manufacturers currently are not producing engines with add-on PM controls for off-road applications. The purchaser of a new agricultural engine would have to arrange to have retrofit controls installed after purchase. It would be very difficult for the individual farmer or the local engine dealer to arrange for installation of retrofit controls since it is currently not an option offered by the engine manufacturer. Staff believes that to successfully implement retrofits requirements for engines in agricultural service, bolt-on retrofit kits design by the engine manufactured will be needed.

In addition to the retrofit installation and availability issue, there is an implementation and enforcement issue regarding new and in-use agricultural engines. Health and Safety Code section 42310 exempts any equipment used in agricultural operations from having to obtain a permit. Staff believes that it would be extremely difficult and resource intensive to implement retrofit control requirements without a permitting system. Requiring a permit provides a mechanism for obtaining critical data on engine location, make/model, model year, horsepower, and operating hours. More importantly, it provides an enforceable mechanism for the district to obtain the information necessary to determine if the selected equipment is capable of meeting the requirements of the ATCM. Because of the permitting restriction, staff believes that the best approach is to require new agricultural engine to meet the lowest achievable off-road engine standards and to not require retrofits on in-use agricultural engines.

Finally, staff is also concerned that requiring retrofit control for new engines would provided a disincentive for replacing older, dirtier engines. Currently a large number of older agricultural engines have been replaced with newer engines meeting the 0.15 g/bhp-hr PM standard under the Carl Moyer program. Requiring retrofit controls would increase the cost of a new engine by 25 to 40 percent, making it less likely that older engines would be replaced. Requiring retrofit controls would also require more Moyer funds to be spent on fewer engines. Due to increased costs, we believe that requiring retrofit controls on in-use engines may make it less likely that these engines will be removed from service and replaced with electric power. We believe that replacing diesel engines with electric power may be the best long term approach for reducing PM and NOx emission from stationary agricultural engines.

*Is the 0.15 g/bhp-hr diesel PM emission limit technologically achievable?*

The 0.15 g/bhp-hr is technologically achievable because

- Newly manufactured off-road engines less than 175 hp are held to less stringent standards, but certification data indicate that approximately 18 percent of the off-road certified engines emitted diesel PM at a rate less than or equal to 0.15 g/bhp-hr.
- Off-road Certified Engines with horsepower ratings from 175 to 299 have been required to meet a 0.15 g/bhp-hr standard since 2003.
- Off-road Certified Engines with horsepower ratings from 300 to 599 have been required to meet a 0.15 g/bhp-hr standard since 2000.
- Off-road Certified Engines with horsepower ratings greater than 600 to 750 have been required to meet a 0.15 g/bhp-hr standard since 2002.
- Seven stationary diesel-fueled engines were tested for diesel PM emission rate as part of the ARB/CE-CERT Diesel PM Control Technology Demonstration (see Appendix H, Control Technology Demonstration). Of the seven, two of the engines emitted diesel PM at a rate less than or equal to 0.15 g/bhp-hr. The remaining five were retrofitted with different diesel PM control technologies. These control technologies included emulsified fuels, active and passive diesel particulate filter systems, and diesel oxidation catalysts. All five engines were tested after the control technologies were implemented and all five engines emitted diesel PM at levels below 0.15 g/bhp-hr.

**Diesel PM Limit: 0.01 g/bhp-hr**

*To what engine applications does this diesel PM limit apply?*

- New and in-use emergency standby engines that are operated less than or equal to 100 hours per year for maintenance and testing purposes.
- New and in-use prime engines

*Why is this limit appropriate for these applications?*

New and In-Use Emergency Standby Engine Applications

As discussed in the previous subsections, ARB staff's approach in defining BACT for new and in-use emergency standby engine applications has been to establish emission rate limits and planned hours of operation limits that, together, result in an acceptable level of risk. Our air dispersion modeling shows that most engines that emit diesel PM at an emission rate of 0.01 g/bhp-hr could operate for up to 100 hours per year without exceeding a potential cancer case threshold of about one potential cancer case per million.

As discussed in the previous subsection, ARB survey data indicates that is technically feasible for many owners to reduce their hours of operation for maintenance and testing to well below 100 hours per year, and that a limit on maintenance and testing hours of operation is appropriate because these hours of operation are planned hours of operation and represent the mode of operation where the most hours are accumulated. The owner or operator has control over how long these engines are run in this mode, while emergency use hours by definition are unplanned and are typically much less than the scheduled hours of operation for maintenance and testing.

<u>New and In-Use Prime Engines</u>

Defining BACT for prime engine applications differs from emergency standby applications because prime engines have no limit on their hours of operation. Therefore, ARB staff had to establish BACT based solely on diesel PM emission rate. Our air dispersion modeling shows that most engines that emit diesel PM at an emission rate of 0.01 g/bhp-hr could operate for up to 1000 hours per year without exceeding a potential cancer case threshold of about 10 potential cancer case per million. According to survey response information, the average hours of operation for a stationary prime diesel-fueled CI engine is approximately 1000 hours per year. (See Appendix C, Stationary Prime Diesel-Fueled Engine Survey.)

*Is the 0.01 g/bhp-hr diesel PM emission limit technologically achievable?*

The 0.01 g/bhp-hr is technologically achievable because

- Two stationary diesel-fueled engines that were tested for diesel PM emission rate as part of the ARB/CE-CERT Diesel PM Control Technology Demonstration were able to achieve a diesel PM emission rate of equal to or less than 0.01 g/bhp-hr through the application of DPF technologies.
- In support of its Verification application to the ARB, CleanAIR Systems has submitted diesel-fueled CI engine emission test data that shows its Passive DPF technology, the PERMIT technology, is capable of diesel PM emission rate reductions of 85 percent and greater, and has resulted in reducing diesel-fueled CI engine emission rates to below 0.01 g/bhp-hr. (ARB, 2003)

**Diesel PM Limit: 30 percent reduction from baseline levels**

*To what engine applications does this diesel PM limit apply?*

- In-use prime engines that are not certified in accordance with the Off-Road Compression Ignition Engine Standards (title 13, CCR, section 2423).

*Why is this limit appropriate for these applications?*

The "30 percent reduction, by weight, from baseline levels" option is one part of a two-part standard that is applicable only to in-use, uncertified engines. Owners that choose this option for compliance are required to meet the 30 percent reduction by no later than January 1, 2006, and then meet a more stringent standard of 0.01 g/bhp-hr by July 1, 2003. ARB staff believes this option will be used by owners of older, uncertified engines that may have difficulty in meeting the 85 percent reduction requirement by the compliance dates specified in the proposed ATCM. This is especially true of older, two-stroke engines with baseline diesel PM emission rates above 0.40 g/bhp-hr, relatively cooler average exhaust temperatures (less than 300 C) and relatively higher fractions (above 30 percent) of the diesel PM comprised of soluble organics. Owners of these engines may opt to reduce their diesel PM emissions by at least 30 percent through the application of diesel emission control systems that are based on the use of a diesel oxidation catalyst. (DieselNet, 2002)

Although the short-term risk from engines that choose to meet this two-part standard will be greater than those that meet the 85 percent reduction limit by the compliance dates specified in the proposed ATCM (January 2006-2009), ARB staff's believes the additional risk reductions associated with reducing the diesel PM emission rate of these engines to 0.01 g/bhp-hr by 2011 will result in an overall reduction in risk benefit over the lifetime of the engine.

*Is the 30 percent reduction diesel PM emission standard technologically achievable?*

The 30 percent reduction, by weight, diesel PM standard is technologically achievable because:

- A 1985 two-stroke Detroit Diesel V92 equipped with a diesel oxidation catalyst was tested as part of the ARB/CE-CERT Diesel PM Control Technology Demonstration, and was able to achieve a diesel PM emission rate reduction of 47 percent, by weight. (See Appendix H, Control Technology Demonstration.)
- Diesel oxidation catalysts are the most common currently used form of diesel aftertreatment technology and have been used for compliance with the PM standards for on-highway diesel-fueled engines since the early 1990's.

**Diesel PM Limit: 85 percent reduction from baseline levels**

*To what engine applications does this diesel PM limit apply?*

- In-use prime engines

*Why is this limit appropriate for these applications?*

In establishing the diesel PM emission standards for in-use prime engines, ARB staff recognized that not all of these engines will be able to meet the 0.01 g/bhp-hr emission standard. Although the ARB/CE-CERT Diesel PM Control Technology Demonstration and the Verification program has shown that the 0.01 g/bhp-hr emission standard is achievable by in-use engines retrofitted with diesel particulate filter technologies, these engines had baseline diesel PM emission rates that were 0.15 g/bhp-hr and less. (See Appendix H, Control Technology Demonstration.) For engines with emission rates that are greater than 0.15 g/bhp-hr., the 0.01 g/bhp-hr standard may not be achievable. However, ARB staff believes that an 85 percent reduction in diesel PM emission rates is achievable for most in-use diesel-fueled engines. This is consistent with the test information summarized in the Risk Reduction Plan to Reduce Particulate Emissions from Diesel-Fueled Engines and Vehicles, October 2000.

*Is the 85 percent reduction, by weight, PM emission limit technologically achievable?*

- In support of its Verification application to the ARB, CleanAIR Systems has submitted diesel-fueled CI engine emission test data that shows its Passive DPF technology, the PERMIT technology, is capable of diesel PM emission rate reductions of 85 percent and greater, and has resulted in reducing diesel-fueled CI engine emission rates to below 0.01 g/bhp-hr.
- Two stationary diesel-fueled engines that were tested for diesel PM emission rate as part of the ARB/CE-CERT Diesel PM Control Technology Demonstration were able to achieve a diesel PM emission rate reduction of at least 85 percent, by weight, through the application of DPF technologies.

**REFERENCES:**

California Air Resources Board. *Letter from Robert H. Cross, Mobile Source Control Division, to Dr. Mike Tripodi, CleanAIR Systems, Reference # RAS-03-19*; June 6, 2003. (ARB, 2003)

DieselNet. *Technology Guide: Diesel Oxidation Catalyst*; 2002. (DieselNet, 2002)

# Appendix G

# Test Method Workgroup

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Tables and Figures

## I. Background

During the development of the proposed air toxic control measure (ATCM), several concerns were raised regarding the inconsistencies between test methods used to certify off-road engines and the methods commonly used by air pollution control districts to measure emissions from stationary engines. Filter-based test methods for diluted exhaust (off-road methods) have been standard for mobile and off-road engines, while stationary source methods have been the standard for new source review, compliance and permitting of stationary engines. Stationary source or compliance test methods include filterable and condensable components from undiluted exhaust. Since engine certification and verification programs typically require filter-based methods on diluted exhaust, the emission results do not correlate with and generally can not be used to compare with stationary source compliance test results used in permitting and new source reviews.

To better understand the technical issues, a Test Method Working Group was created. The goals of the workgroup were to compare the two sampling approaches and make recommendations for a test method that could be used to demonstrate compliance with the ATCM. The workgroup consisted of members from district staff representing California Air Pollution Control Officers Association (CAPCOA/District), Engine Manufacturers Association (EMA), Manufacturers of Emission Controls Association (MECA), engine manufacturers including Caterpillar and Cummins, Air Resources Board (ARB) and UC Riverside's Center for Environmental Research and Technology (UCR CE-CERT)
In addition, the workgroup addressed issues with ARB Method 5 raised by engine and control device manufactures as follows (EMA, 2002):

- Poor repeatability and test data bias.
- Inadequate accuracy and resolution, especially for the very low levels of particulate matter (PM) emitted with the use of exhaust emission control devices.
- Use of different sampling protocol that effectively result in measurement that has no defined relationship to PM data measured by engine or emission control equipment manufacturers using required certification test methods.
- PM test results that differ from real-world atmospheric particle behavior as compared to dilution measurement methods.
- Use of isokinetic sampling procedures designed for PM size ranges not found in engine emissions.
- A disconnect between the test method required to demonstrate field compliance with the methods and data originally used to develop the CA emissions standards.

In evaluating the use of off-road methods such as the International Organization for Standardization Reciprocating Internal Combustion Engines-Exhaust Emission Measurement (ISO 8178) for stationary source evaluations, the workgroup also addressed the issues of limited field availability and the impact of changing the testing methods for stationary source evaluations. (ISO/DP 8178, 1992)

The two sampling approaches have key differences including exhaust dilution, filter temperatures and condensable components, which result in emission factors that lack correlation. This difference in stationary and off-road test methods makes it difficult to utilize data generated under U.S. EPA Certification Guidance for Engines Regulated Under: 40 CFR Part 86 on-Highway Heavy Duty Engines and 40 CFR Part 89 Nonroad CI Engines (U.S. EPA Nonroad Certification) and ARB Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines (Verification Procedure) programs in stationary source programs. (EPA, 1999) (ARB, 2002) Furthermore, the proposed emission limits and control efficiencies included in this regulation are derived from certification and verifications that utilize filter based dilution off-road methods. The use of existing data for new or retrofitted engines could reduce the need for expensive emission testing to demonstrate compliance with the requirements of this regulation.

To compare the test methods, UCR CE-CERT performed five direct method comparison tests on stationary or portable diesel generators. Table G-1 lists test engine information and fuel sulfur content, (if available) for the test method comparison. The study included comparisons on four baseline (uncontrolled) engines and one engine retrofitted with a passive diesel particulate filter. For the retrofitted engine, both baseline and controlled PM emission factors were measured. In addition, measured control device efficiency was calculated for both test methods.

**Table G-1: Test Engine Information and Fuel Sulfur Content**

| Engine Make/Model | Emission Controls | Test Load 100% load | Fuel (fuel sulfur ppm, if available) |
|---|---|---|---|
| Detroit Diesel 8V-92 1991 2 Stroke | Uncontrolled | 2 Stroke 469 hp | CARB Diesel (374 ppm) |
| Cat 3406B 1991 4 Stroke | Uncontrolled | 4 Stroke 422 hp | CARB Diesel (90 ppm) |
| Detroit Diesel Series 60 1999 4 Stroke | Uncontrolled | 4 Stroke 402 hp | CARB Diesel (144 ppm) |
| Cat 3406 C 2000 4 Stroke | Uncontrolled | 4 Stroke 466 hp | CARB Diesel |
| Cat 3406 C 2000 4 Stroke | Passive DPF | 4 Stroke 466 hp | ULSD (< 15 ppm) |

## II. Test Methods

For stationary source type sampling, ARB Method 5 Determination of Particulate Matter Emissions from Stationary Sources (Method 5 or M5) was used to measure PM and ARB Method 100 Procedures for Continuous Gaseous Emission Stack Sampling (Method 100 or M100) was used to measure gaseous emissions of $CO_2$, CO, NOx, $NO_2$, total hydrocarbons (THC). (ARB, 1983) (ARB, 1983a) For the off-road test methods, ISO 8178 was used to measure PM and gaseous emissions of $CO_2$, CO, NOx, $NO_2$, total hydrocarbons (THC) and non-methane hydrocarbons (NMHC). Table G-2 provides an overview of the two test methods. Table G-3 lists the summary continuous emission monitoring systems used to sample gaseous emissions for both ARB Method 100 and ISO 8178.

**Table G-2: Overview of Test Methods**

| Method | ARB Method 5 | ISO 8178 |
|---|---|---|
| Description | Standard stationary engine test method. | Standard test method for off-road testing, certification and verification programs. |
| Dilution Method | Undiluted exhaust<br>Isokinetic | Diluted exhaust<br>Nonisokinetic or Isokinetic allowed |
| Filter Component | Filter<br>$248\pm25\ ^{o}F$ $(120\pm14\ ^{o}C)$ | Filter<br>Below $125^{o}F$ ($52\ ^{o}C$) |
| Impinger Component (back half) | Impinger (~60 °F) | No Impinger |
| Field Availability | Field available | Laboratory or test bed availability<br>Limited field availability |
| Engine loads | Method does not define test loads | Method defines engine test loads and speeds |

**Table G-3: Continuous Gaseous Sampling Analyzers**

| Gaseous Pollutant | Stationary Source Testing Per ARB Method 100 | Off Road Testing Per ISO 8178 |
|---|---|---|
| NOx | Chemiluminescence | Chemiluminescence |
| $NO_2$ (see Note 1) | Chemiluminescence | Chemiluminescence |
| CO | Non-dispersive infrared (NDIR) | Non-dispersive infrared (NDIR) |
| $CO_2$ | Non-dispersive infrared analyzer | Non-dispersive infrared (NDIR) |
| Total Hydrocarbons | Flame ionization detector (FID) or non-dispersive infrared analyzer (NDIR) | Flame ionization detector (FID) |
| $CH_4$ and Non methane Hydrocarbons (NMHC) | Not analyzed | GC combined with FID to measure $CH_4$. NMHC from difference between THC and $CH_4$ |

Note 1: Speciated $NO_2$ is not included in either test method. It was included in this study as required by ARB Verification Procedure.

All tests were performed using a 3-mode D1 test cycle and weighting factors as specified in the ISO 8178 Part 4. Load, speed and weighting factors for the ISO 8178 D1 test cycle are listed in Table G-4.

**Table G-4: Weighting Factors for ISO 8178 D1 Test Cycle**

| Mode number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Torque, % | 100 | 75 | 50 | 25 | 10 | 100 | 75 | 50 | 25 | 10 | 0 |
| Speed | Rated speed | | | | | Intermediate speed | | | | | Low idle |
| Type D1 | 0.30 | 0.50 | 0.20 | | | | | | | | |

<u>ARB Method 5</u>

Stationary source type sampling with ARB Method 5 is performed by drawing the raw exhaust directly through a heated filter and a series of impingers in an ice bath. The total PM is composed of the filterable component caught on the filter and the condensable portion caught in the impingers. The total PM catch is itemized by weight as (1) Filter Catch, (2) Probe Catch (3) Impinger Catch and (4) Solvent Extract. The sample is drawn isokinetically from the exhaust stack and through a filter to collect filterable PM. The filter is maintained at a temperature of 248 °F $\pm$ 25 °F to ensure that no moisture condenses on the filter. After passing through the filter, the sample gas is drawn through a set of impingers, which are maintained below 68 °F. After sampling for a specified time, the filter is recovered and weighted along with the weight of the particulate from the probe rinse. The filter catch combined with the probe catch (probe wash) is commonly referred to as the front half. The weight of the condensable particulate is determined by recovering the impinger liquid, extraction with methylene chloride and evaporation of the aqueous and methylene chloride extract to determine the condensable PM weight. The condensable portion remaining after evaporation of the aqueous portion is reported as the impinger catch. This portion is also commonly referred to as the inorganic portion of the backhalf. The condensable portion remaining after evaporation of the methylene chloride solvent is reported as the solvent extract. It is commonly referred to as the organic portion of the backhalf. The PM concentration is determined by dividing the weight of the total particulate catch by the volume of gas sampled.

Mass emission rates in grams/hour for particulate and gaseous emissions can be calculated with the average emission concentrations and the stack gas flowrate and moisture content. Stack gas flowrate and moisture content can be determined using ARB Methods 1 Sample and Velocity Traverses for Stationary Sources (Method 1), Method 2 Determination of Stack Gas Velocity and Volumetric Flow Rate (Method 2), Method 3 Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight (Method 3) and Method 4 Determination of Moisture Content in Stack Gasses (Method 4). (ARB, 1993b) (ARB, 1993c) (ARB, 1993d) (ARB, 1993e) Stack gas velocity is determined from a pitot tube measurement using ARB Methods 1 and 2 allowing computation of the total mass flow rate of diluted exhaust.

ISO 8178

Off-road type sampling is performed by diluting the exhaust with conditioned air and drawing the diluted sample through a particulate filter. PM sampling is done from diluted exhaust gas. This is achieved by turbulent mixing of exhaust gases with air in a dilution tunnel. The total PM is composed of a filterable component only. Off-road type sampling was performed using a 1992 draft version ISO 8178. This older draft version was used since it was directly incorporated by reference into the *California Exhaust Emission Standards and Test Procedures for New 1996 and Later Off-Road Compression-Ignition Engines Part II.* (ARB, 1993)

UCR CE-CERT performed dilution testing with a mobile full-flow constant volume (CVS) sampling laboratory. In the CVS method, the exhaust gases are diluted with air to maintain a constant total flow rate (air + exhaust) under all running conditions. Total exhaust (full-flow) is collected and mixed with air in the full-flow primary dilution tunnel. A sample for particulate measurement is drawn from that tunnel into a small secondary dilution tunnel, further mixed with air and collected on particulate filters maintained at or below 125 °F. Samples for continuous gas phase measurements are drawn from the primary dilution tunnel. The volumetric flow rate is of the diluted exhaust gas is measured using a critical flow venturi and the temperature and pressure of the flow are measured allowing computation of the total mass flow rate of diluted exhaust.

## III. Summary of Results

D1 emission factors were calculated using the individual modal data and D1 weighting factors for direct comparison between the ARB Method 5 and ISO 8178 emission tests. The ARB Method 5 emission factors were calculated using the filter only, the front half and the total PM (filter catch, probe catch, impinger catch and solvent extract). Table G-5 lists D1 weighted PM emission factors for ARB Method 5 components and ISO 8178 results. Figure G-1 shows the calculated emission factors for ARB Method 5 filter only, Method 5 front half and ISO 8178. Figure G-2 shows the calculated emission factors for ARB Method 5 total PM and ISO 8178. For each of the test engines, the individual modal emissions for both ARB Method 5 and ISO 8178 testing are shown in Figures G-3 through G-7.

**Table G-5: Average D1 Weighted PM Emission Factors for ARB Method 5 and ISO 8178 Test Results**

| Engine | ARB Method 5 D1 Weighted Emission Factor | | | ISO 8178 D1 Weighted Emission Factor | Ratio | Ratio |
|---|---|---|---|---|---|---|
| | Filter only | Front Half (Note 1) | TPM | | M5 Filter / ISO 8178 | M5 TPM / ISO 8178 |
| DD 8V-92 | 0.125 | 0.153 (Note 2) | 0.475 | 0.131 | 0.96 | 3.64 |
| DD 60 99 | 0.050 | 0.060 (Note 2) | 0.187 | 0.057 | 0.88 | 3.31 |
| CAT 3406B | 0.092 | 0.112 (Note 2) | 0.266 | 0.111 | 0.83 | 2.41 |
| Cat 3406C Baseline | 0.123 | 0.145 | 0.230 | 0.110 | 1.13 | 2.10 |
| Cat 3406 C DPF Controlled | 0.016 | 0.021 | 0.060 | 0.017 | 0.97 | 3.52 |
| % reduction Passive DPF | 86.7 | 85.8 | 74.0 | 84.5 | | |

Note 1. Front Half includes probe wash and filter weight.
Note 2. Estimated based on results from CAT 3406C baseline and controlled test using average (Front Half)=1.21(Filter Only). Probe wash was not reported separately for these three engines.

Figure G-1: D1 Weighted Emission Factors - M5 Filter, M5 Front Half and ISO 8178 Filter

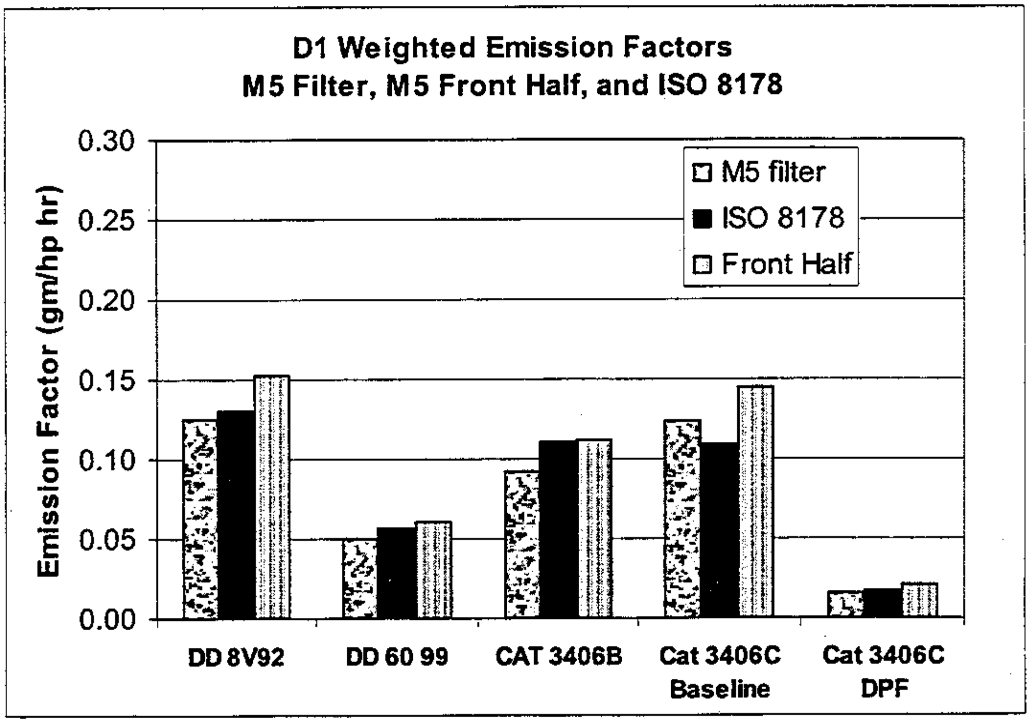
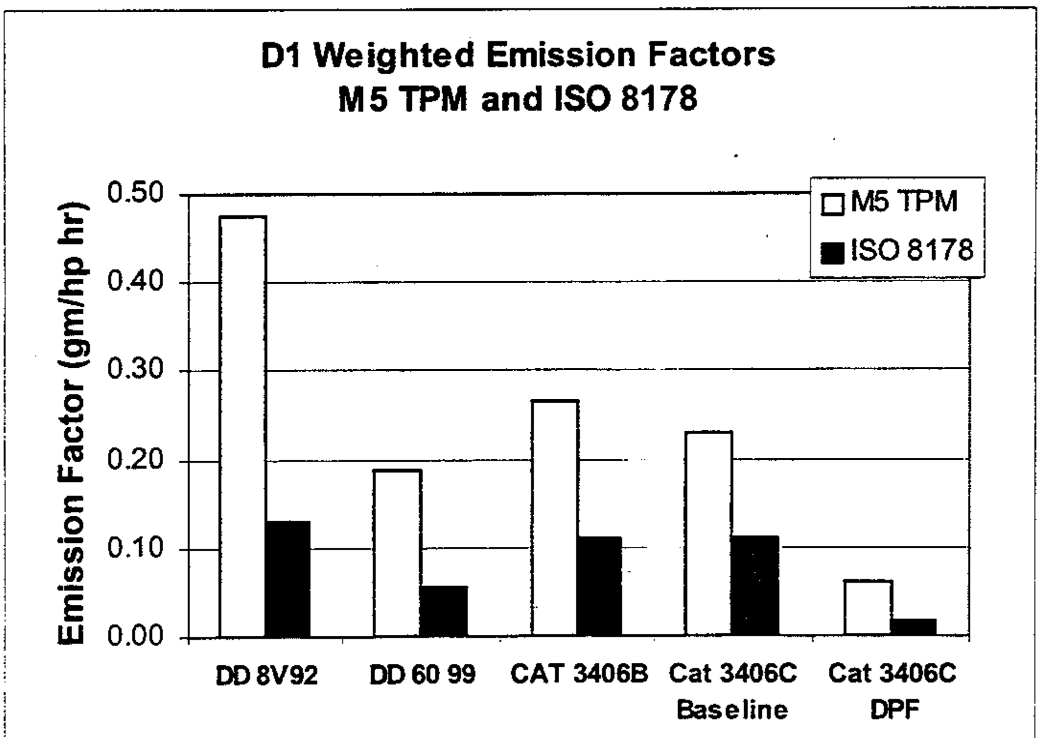



Figure G-2: D1 Weighted Emission Factors - M5 Total PM and ISO 8178 Filter



The test results indicate that total PM measured using ARB Method 5 are two to four time higher than total PM measured by ISO 8178. In comparing ARB Method 5 filter only, ARB Method 5 front half catch with ISO 8178 total PM, the results show good agreement. This data indicate that the differences in exhaust dilution and filter temperature conditions may not have as significant impact as inclusion of a condensable component, when measured gravametrically. The condensable portion can be as large as 75 percent of the total PM.

The control device efficiency, as listed in Table G-5, was calculated from the change in emission factors divided by the baseline emission factors for 1) the Method 5 filter only, 2) Method 5 front half, 3) Method 5 total PM, and 4) ISO 8178. Again, there was good agreement between the control efficiencies measured by Method 5 filter only, Method 5 front half and ISO 8178, all close to 85 percent. The 75 percent reduction calculated using ARB Method 5 total PM was lower. Since all the calculated control efficiencies were lower than a projected 90 percent, the unit was inspected by the manufacturer's technician. During the inspection, a leak was found in the seal between the ceramic filter and the housing. Upon completion of the comparison study, the leak was sealed and control efficiency increased to approximately 91 percent, based on further ISO 8178 testing.

In summary, comparisons of the D1 weighted emission factors for the two test methods indicate the following

- ARB Method 5 total PM is 2 to 4 times higher than ISO 8178 PM.
- ARB Method 5 filter only, ARB Method 5 front half and ISO 8178 levels showed good agreement.
- Measured control efficiency was lower using ARB Method 5 total PM
- Measured control efficiency was similar for ARB Method 5 filter only, ARB Method 5 front half and ISO 8178 methods.

## IV. Discussion

While there are many differences in stationary source and off-road type testing, the inclusion of the condensable component may have the largest effect. While ARB Method 5 includes a condensable component, the off-road methods typically include only a filterable component. Proponents of the off-road methods argue that the stationary source methods which includes condensable PM such as ARB Method 5 overestimate the PM by including artifacts or secondary particulate formed from the interaction of particulate precursors including sulfur dioxide, sulfur trioxide, oxides of nitrogen and ammonia with water in the impinger. (England, 2000)

Proponents of stationary source methods such as ARB Method 5 argue that off-road methods underestimate condensable portion of the total PM by using sampling temperatures that are higher than ambient temperatures and by excluding secondary particulate formation that may occur in the condensable impinger portion of stationary source test methods. In addition, the off-road methods are based on dilution techniques requiring equipment that is generally limited to test bed facilities. Since stationary source engines are not portable and require compliance methods that can be performed in the field, off-road methods have not been available for stationary source testing until very recently. With the development of mobile test labs and minidilution systems, off-road dilution based methods are becoming available for field-testing, but are not widely available at this time. Also, some of the commercial minidilution systems do not have integrated exhaust flow measurement capabilities and rely on the same types of flow measurements used in stationary source testing. Precise measurement of the exhaust flow rate is essential to accurately determine the mass emission rate of the pollutant as required by most regulations.

## V. Recommendations

The emission levels and control efficiencies contained in the regulation are derived from off-road engine certification and verification programs. These programs are generally based on dilution methods that include specified test cycles. Based on the results of this method comparison, the limits contained in this regulation may not be able to be met using a compliance method that contains a condensable component. As determined in this study, ARB Method 5 total PM is two to four times higher than ISO 8178 emission factors. In addition, measured control device efficiency was lower when using ARB Method 5 total PM. Other studies evaluating the condensable component have shown that particulate levels in the condensable portion are dependent on fuel sulfur levels and sampling. (England, 2000) Since total PM levels are much lower in controlled engines, required sample times can increase significantly, potentially increasing the level of secondary particulate formation. While many of these devices do require low sulfur fuel, some manufacturers are developing selective catalysts to be used with higher fuel sulfur level, which may also increase the potential for sulfate formation in the backhalf component.

In order to harmonize with certification and verification programs, staff recommend ISO 8178 as the primary test method for to demonstrate compliance with the requirements of this regulation. Since there is good agreement between the emission factors calculated from ARB Method 5 front half portion and ISO 8178 emission factors, staff recommends allowing ARB Method 5 front half (filter + probe wash) to be used as an alternative. When using ARB Method 5 front half as an alternative to ISO 8178, staff recommend using steady–state emission test cycles as outlined in ISO 8178 Part 4.

We believe that using the front half component as a measure of diesel PM emissions is consistent with the methodologies that were used to estimate diesel PM exposure concentrations in the key epidemiological studies supporting the identification of diesel PM as a toxic air contaminant. In the railroad worker study, diesel exhaust exposure was estimated using personal samplers and fixed Hi-volume samplers. (OEHHA, 1998) The high exposure group included individuals working in the close proximity to locomotives. Given the close proximity of the exposed individuals to the source of diesel exhaust emissions, we believe that the PM measured was predominately "fresh" (i.e. minutes old) diesel exhaust emissions. That is, diesel exhaust which had not undergone significant atmospheric transformation. Because the impinger catch passes the diesel exhaust through two water impingers, the PM captured in the impingers is more representative of "aged" (i.e. hours to days old) diesel exhaust. Thus, we believe that "fresh" diesel emissions are best estimated by using the front half component without counting the material collected in the impinger. Using the impinger catch may overestimate the diesel PM concentration compared to the concentrations found in the health studies. In the truck driver study, measurements of elemental carbon were used as a surrogate for diesel exhaust emissions. Elemental carbon is exclusively captured in the front half. Thus, using the front half catch without counting the material collected in the impinger is appropriate for measuring elemental carbon.

Since the key epidemiological studies focused on "fresh" diesel exhaust or elemental carbon, we believe that using the front half to estimate PM emission is consistent with the techniques used to establish diesel PM as a toxic air contaminant.

Figure G-3: MY 1991 CAT 3406B Baseline

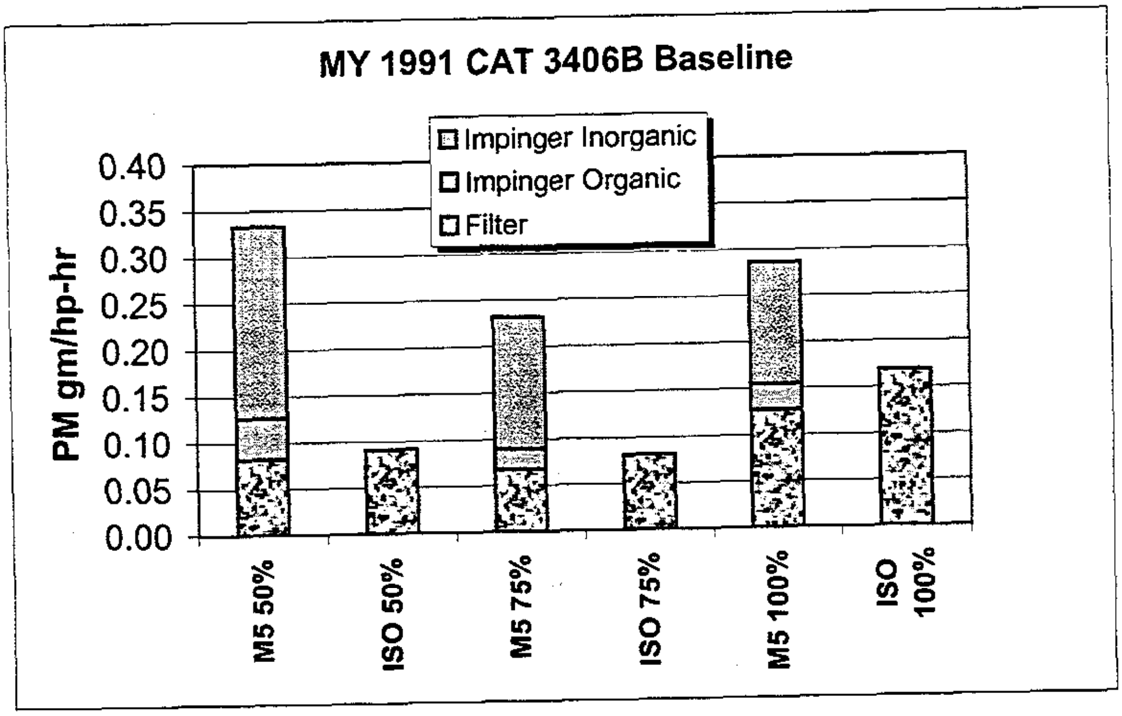



Figure G-4: MY 1991 DDC 8V 92 Baseline

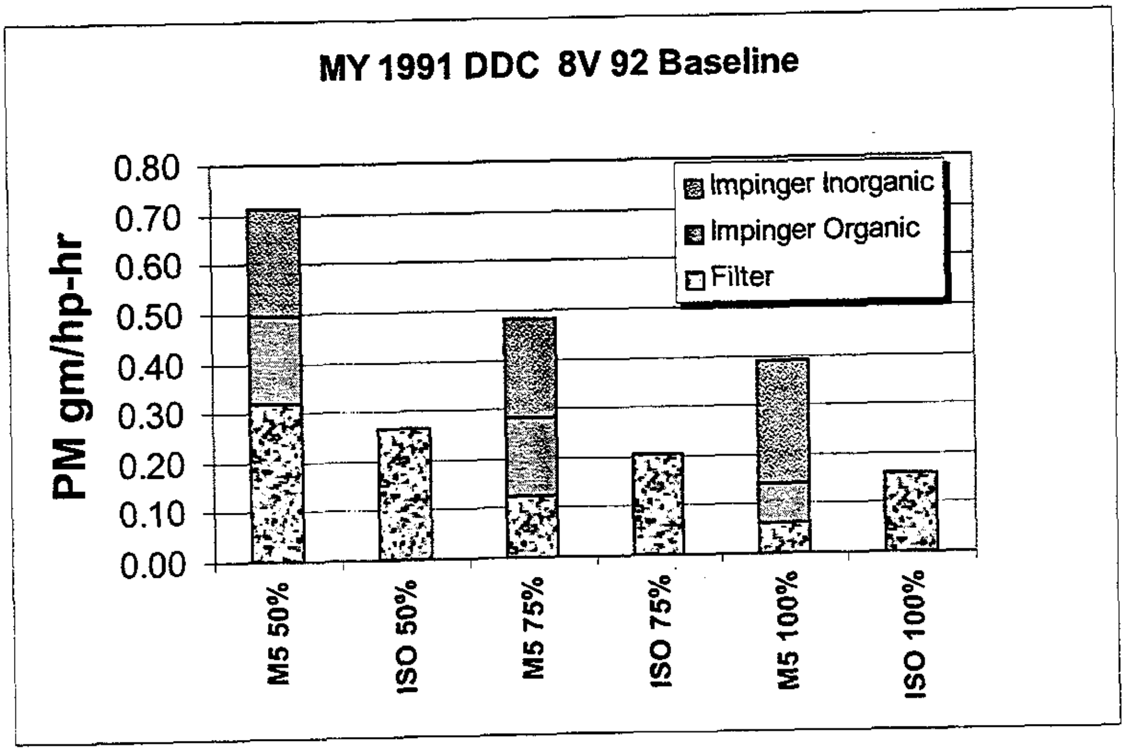


**Figure G-5: MY 1999 DDC Series 60 Baseline**

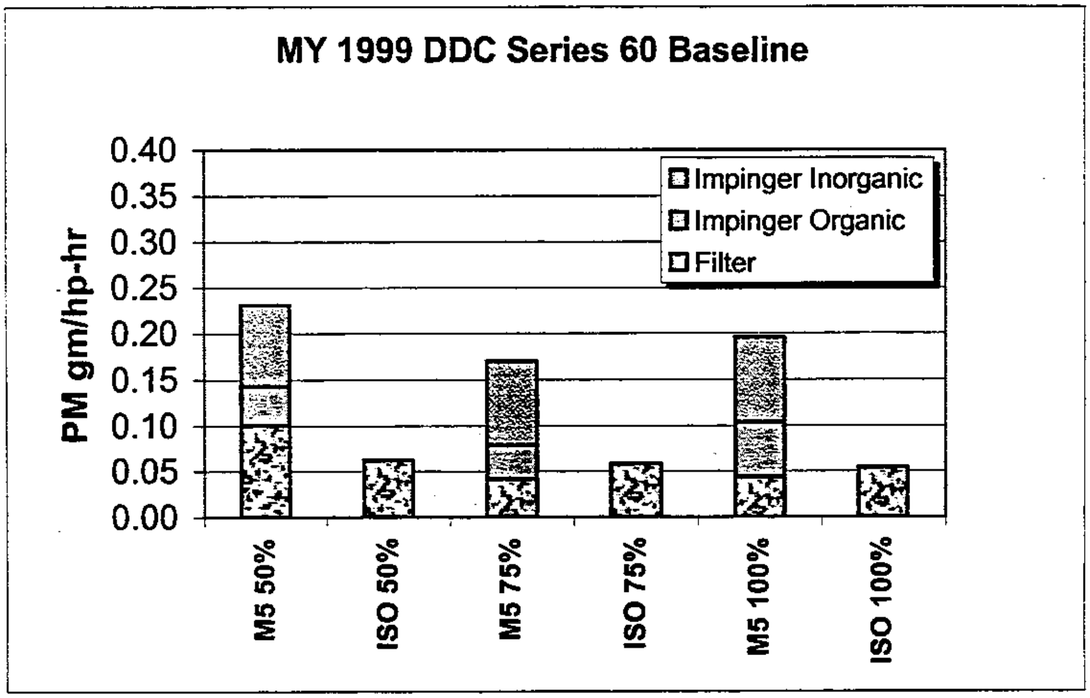


Figure G-6: MY 2000 CAT 3406C Baseline

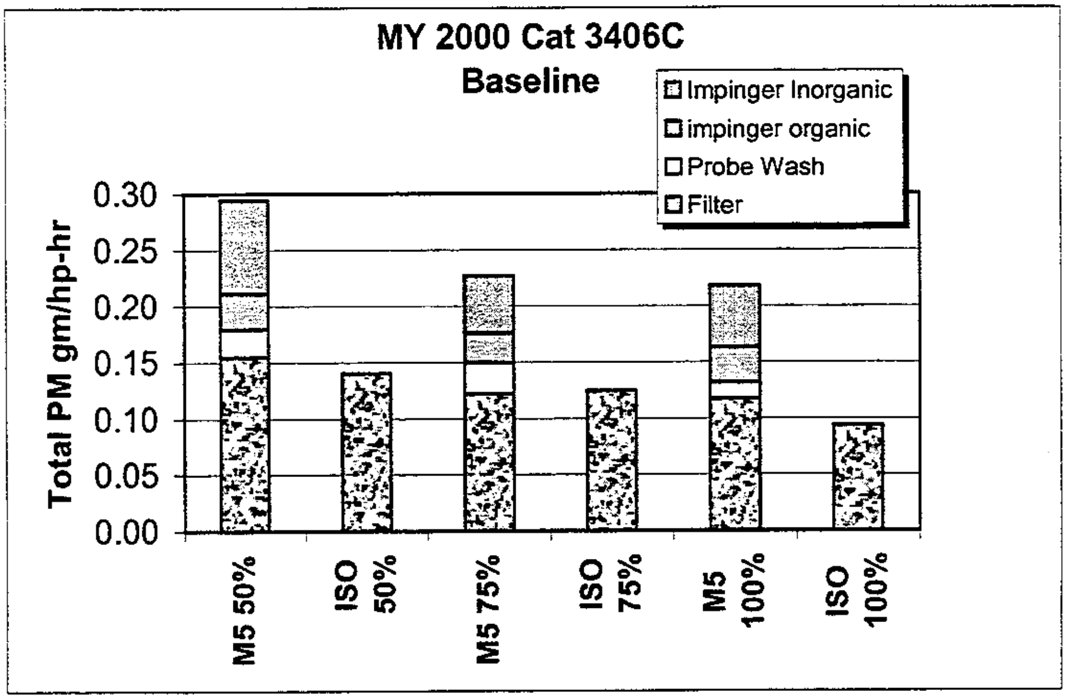
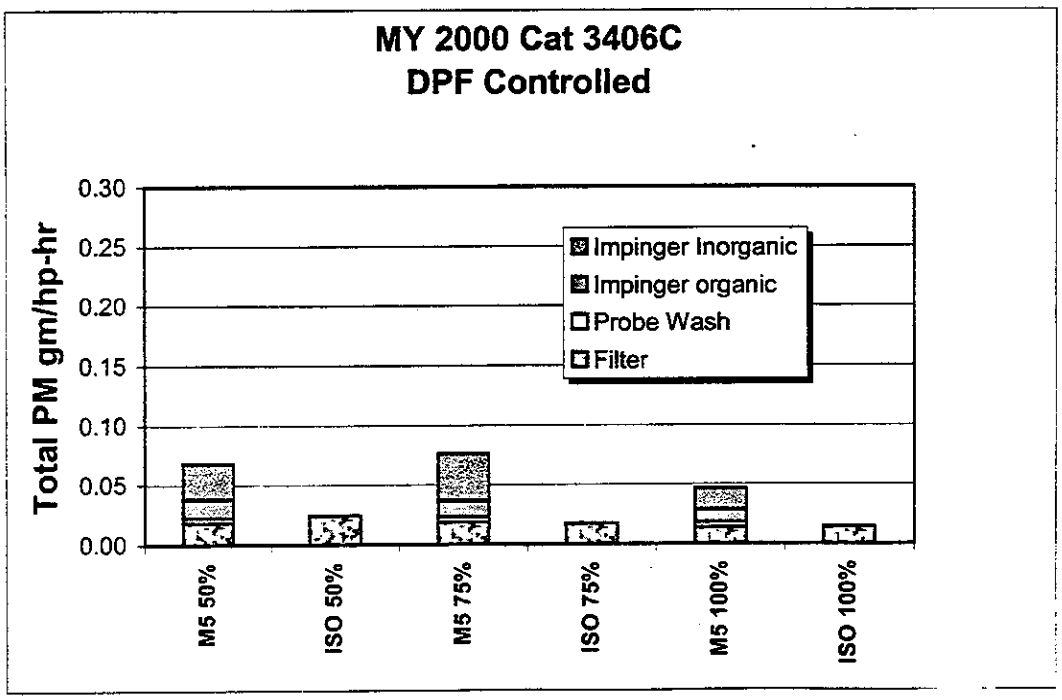



Figure G-7: MY 2000 CAT3406C DPF Controlled



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California Air Resources Board. *Method 100 Procedures for Continuous Gaseous Emission Stack Sampling*; Adopted June 29, 1983, Amended July 28, 1977. (ARB, 1983a)

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England, Glenn C., et al. *Characterizing PM2.5 Emission Profiles for Stationary Sources: Comparison of Traditional and Dilution Sampling Techniques*, Fuel Processing Technology 65-66, 177-188, Elsevier Science; 2000. (England, 2000)

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# Appendix H

## Diesel PM Control Technology Demonstration Program for Stationary Applications

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Tables and Figures

# I. Background

There are a number of potentially effective emission control technologies for stationary applications available to reduce diesel particulate matter (PM). Diesel particulate filters (DPFs) and diesel oxidation catalysts (DOCs) have been effective for on-road applications and show potential for stationary engine applications, as well. To gather additional data on the technical feasibility of diesel PM control technologies and the applicability to stationary diesel-fueled engines, the Air Resources Board (ARB) funded a demonstration program. The purpose of the demonstration program was to:

- Demonstrate diesel PM control technologies on stationary engines.
- Identify applications and operating duty cycle conditions where specific particulate filter technologies may or may not be effective.

In this appendix, a brief background on the demonstration project is provided along with a description of the control technologies evaluated, the test results and the preliminary findings.

The stationary engine control device demonstration was performed in conjunction with a California Energy Commission Back-up Generator Program (CEC BUG). (CEC, 2001) The demonstration included testing of backup generators for baseline emission levels, retrofitting selected engines with commercially available PM control devices and testing controlled emission levels.

Emissions were tested for PM, total hydrocarbons (THC), methane, nonmethane hydrocarbons (NMHC), $CO_2$, CO, NOx, $NO_2$ per International Organization for Standardization Reciprocating Internal Combustion Engines-Exhaust Emission Measurement (ISO 8178) Parts 1, 2, and 4. (ISO/DP 8178, 1992) A five-mode D2 test cycle was used in all emission testing. The program was designed to support the testing and data requirements for control device verification under ARB's Verification Procedure, Warranty and In-Use Compliance Requirements of In-Use Strategies to Control Emissions from Diesel Engines (Verification Procedure). (ARB, 2002) To support verification, the test protocol included baseline testing and initial control efficiency, durability and post-durability control efficiency. Durability and post-durability testing was only performed for the devices that initially met the projected control efficiency for the targeted tier level (25 percent, 50 percent, or 85 percent). For the devices that did not meet the initial projected control efficiency, conditional durability and post-durability testing were not performed.

Emission testing was performed by University of California, Riverside, Bourns College of Engineering-Center for Environmental Research and Testing (UCR CE-CERT) under the direction of Wayne Miller, Ph.D.

## II. Control Technologies

Diesel PM control technologies were selected based on a number of criteria: projected PM control efficiencies, commercial availability, demonstrated infield use, willingness of manufacturer to complete the verification process and product cost. Because the Verification Procedure is based on tiered emission levels, devices were selected that were projected to meet 25 percent, 50 percent, and 85 percent PM control. Technologies included emulsified diesel fuel, diesel oxidation catalysts, flow through filter technology and both active and passive particulate filters. When recommended by the control technology manufacturers, fuel-borne catalysts were used to enhance or promote regeneration. The control device technologies that were tested are described in Table H-1.

**Table H-1: Control Strategies Included in Demonstration Program**

| Control Device Manufacturer | Product | Product Description |
|---|---|---|
| Lubrizol-Engine Control Systems | Sequentially Regenerated Combifilter | Triple bank silicon carbide particulate filter with online filter regeneration by electrical heating (Active DPF). |
| Johnson Matthey | Continuously Regenerating Trap (CRT) | Catalyzed diesel particulate filter (Passive DPF). |
| Sud Chemie | SC-DOC | Diesel Oxidation Catalyst (DOC 1). |
| CleanAir Systems Flow-Thru-Filter System and Clean Diesel Technologies (CDT) Fuel-Borne Catalyst | Flow-Thru-Filter System combined with CDT Fuel-Borne Catalyst | Combined system includes a DOC, flow through filter used with a CDT fuel-borne catalyst. The flow through filter component was removed prior to testing due to lower than required exhaust temperatures (DOC with Fuel-Borne Catalyst or DOC/FA). |
| Chevron | Proformix Fuel | Water emulsified fuel (20% water emulsification) utilizes Lubrizol's PuriNOx™ technology (Emulsified Fuel). |
| Catalytic Exhaust Products Particulate Filter and Clean Diesel Technologies Fuel-Borne Catalyst | SXS-B/FA combined with CDT Fuel-Borne Catalyst | Uncatalyzed diesel particulate filter used with a CDT fuel-borne catalyst (Particulate Filter with Fuel-Borne Catalyst or DPF/FBC). |

All baseline engine tests were performed using currently available on-road diesel fuel that meets the specifications defined in Title 13, CCR sections 2281-2281 (CARB Diesel). (CCR Title 13, Sections 2281, 2282) Control device retrofit testing was performed using either CARB diesel or low sulfur diesel fuel (<15 ppm sulfur), as recommended by the control device manufacturer. Water emulsified diesel, developed to reduce both NOx and PM, was also included in the study as a control strategy for evaluation.

## III. Emission Testing

Emissions testing was performed for particulate matter, $CO_2$, CO, NOx, $NO_2$, total hydrocarbons (THC) and non-methane hydrocarbons (NMHC) following the methods specified in ISO 8178. Exhaust analysis of the gaseous components was performed using the continuous measurement methods listed in Table H-2.

**Table H-2: ISO 8178 Recommended Continuous Gaseous Sampling Analyzers**

| Gaseous Pollutant | Ambient Level Sampling Per ISO 8178 |
|---|---|
| NOx and $NO_2$ (See Note 1) | Chemiluminescence |
| CO | Non-dispersive infrared (NDIR) |
| CO2 | Non-dispersive infrared (NDIR) |
| Total Hydrocarbons | Flame ionization detector (FID) |
| CH4 and Non methane Hydrocarbons (NMHC) | GC combined with FID to measure CH4. NMHC from difference between THC and CH4 |

Note 1: Speciated $NO_2$ is not included in this test method. It was included in this study as required by CARB verification procedures.

Emission testing was performed using full-flow constant volume sampling (CVS) per ISO 8178. In the CVS method, the engine exhaust is diluted with air to maintain a constant total flow rate (air + exhaust) under all running conditions. Total exhaust (full-flow) is collected and mixed with air in the full-flow primary dilution tunnel. Particulate matter sampling is done from diluted exhaust gas. This is achieved by turbulent mixing of exhaust gases with air in a dilution tunnel. A sample for particulate measurement is drawn from that tunnel into a small secondary dilution tunnel, further mixed with air and collected on particulate filters maintained 52 °C, maximum. Samples for continuous gas phase measurements are drawn from the primary dilution tunnel. The volumetric flow rate of the dilution air and diluted exhaust gas are measured along with temperatures and pressures, allowing computation of the total mass flow rate of exhaust and mass emission rates of the sampled components.

Eleven engines were tested for baseline emission levels. Seven diesel PM control systems were selected for testing on generators. Testing of the generators fitted with diesel PM control systems included five components:

- Baseline engine testing
- Control device retrofitting and retrofit degreening for 25 hours

- Control device emission testing to establish initial control efficiency
- Durability operation for conditional durability period (168 hours)
- Post-conditional durability emission testing.

During testing, degreening and durability operation, backpressure and exhaust temperature were monitored to establish exhaust temperature profiles, determine conformance to backpressure limits of the engine and ensure that the device was regenerating properly. Testing was performed in triplicate unless additional tests were required to quantify emission levels during distinct regeneration phases.

Durability cycling was performed for the control devices that successfully met the projected control efficiencies during the initial control device testing. The durability cycle included 24 cold starts followed by 24 hours of operation at 30 percent load, 24 hours at 50 percent load and 24 hours at 85 percent load. The cold starts were approximately ½ hour, under no load, with a 12-hour cooling period between starts. This durability cycle was repeated twice to reach the 167 hours required for conditional verification for stationary backup generators. The durability cycle was developed to model typical backup generator cold start maintenance cycling and emergency operation at three different projected operational loads. Since this program was designed to support the requirements of verification, testing was stopped if the device did not meet the projected level of control efficiency, the control device malfunctioned or clogged, or the engine backpressure limits were exceeded.

On successful completion of durability, the retrofitted engines will be emission tested to establish post-conditional durability control levels. The durability and post-durability test phases of the program are currently in progress and are expected to be complete in the late 2003 timeframe.

*Test Cycles:* Mass emission rates were measured at steady-state conditions for specified speeds and loads developed for off-road engine applications as listed in ISO 8178 Part 4. The specified test load was provided by using a generator load cell connected to the test engines. A test cycle includes a set of modes with a specified torque, speed and weighting value designed for specific engine uses. For a given test cycle, a weighted emission factor was calculated using weighted modal emission mass rates and divided by a weighted load value. Three of the common test modes are listed in Table H-3. EPA off-road engine certification is typically based on a C1 test cycle or a D2 test cycle, under special test procedures. Due to different modal loads, speeds and weighting values included in each test cycle, emission factors derived from different test cycles are not directly comparable. Since diesel generators only operate at rated speeds, field-testing could not be performed with a C1 cycle since it includes rated and intermediate speed modes. For generators, both D1 and D2 modes are acceptable. For this testing, the 5-mode D2 test cycle was selected since it is better representative of backup engines that have low load intermittent maintenance operation and higher load functional operation. In addition, a D1 emission factor can also be calculated using modes 1, 2, and 3 and D1 weighting factors.

**Table H-3: Weighting Factors for C1, D1 and D2 Type ISO 8178 Test Cycles**

| Mode number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Torque, %** | 100 | 75 | 50 | 25 | 10 | 100 | 75 | 50 | 25 | 10 | 0 |
| **Speed** | Rated speed | | | | | Intermediate speed | | | | | Low idle |
| **Type C1** | 0.15 | 0.15 | 0.15 | - | 0.10 | 0.10 | 0.10 | 0.10 | - | - | 0.15 |
| **Constant speed** | | | | | | | | | | | |
| **Type D1** | 0.30 | 0.50 | 0.20 | - | - | - | - | - | - | - | - |
| **Type D2** | 0.05 | 0.25 | 0.30 | 0.30 | 0.10 | - | - | - | - | - | - |

*Test Engines:* Test engines were selected based on an analysis of the engine database compiled in CEC's BUG Program (CE-CERT, 2001). The database was developed by cataloging permitted backup generators in California that were greater than 300 kW. A test engine matrix was developed by determining predominant categories of engine manufactures, engine sizes and model years. Based on the analysis and as shown in Table H-4, engines from three manufactures were included in the study: Caterpillar, Cummins and Detroit Diesel. Two engine size categories were selected: 500 to 700 kW and 1500 to 2000 kW. Three model year groupings were selected: pre-1987, 1987-1996, and post-1996. A total of 11 engines were tested for baseline emissions, with one additional planned, in the 500 to 700 kW range. Two engine tests are still planned for the 1500 to 2000 kW range. Once the test engine categories were defined, the specific engine model and model year were selected based on engine availability and control device manufacturer's recommendations. Selection of the appropriate engine was typically based on engine design and operating parameters such as exhaust temperature and emission levels and targeted market for the retrofit device. When stationary engines were not available, equivalent portable generators were used for testing and retrofit.

### Table H-4: Stationary Engine Control Demonstration Program Test Engine Matrix

| Engine | Program ID | Model Year | Control |
|---|---|---|---|
| Detroit Diesel V92 | Bug 2 | 1991 | |
| CAT 3406B | Bug 3 | 1991 | |
| Cummins KTA19G2 | Bug 4 | 1990 | |
| Cummins N14 | Bug 5 | 1999 | |
| Detroit Diesel Series 60 | Bug 6 | 1999 | |
| CAT 3412C | Bug 7 | Post 96 | |
| CAT 3408B | Bug 8 | 1990 | Baseline (Planned) |
| CAT 3406C | Bug 12 | 2000 | Passive DPF |
| CAT 3406C | Bug 10 | 2000 | Active DPF |
| Detroit Diesel V92 | Bug 14 | 1985 | DOC/FBC |
| CAT 3406C | Bug 10 | 2000 | DOC 1 |
| Detroit Diesel V92 | Bug 14 | 1985 | DOC 1 |
| CAT 3406C | Bug 9 | Post 96 | Emulsified Fuel |
| CAT 3406B | Bug 11 | 1986 | Emulsified Fuel |
| CAT 3406C | Bug 10 | 2000 | DPF/FBC (Planned) |

**Table H-5: Average D2 Weighted Emissions Factors for Baseline Engine Testing**

| | | | | D2 Weighted Emission Factors (g/bhp-hr) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Engine Make and Model** | **Model Year** | **Fuel** | **Load (hp)** | **THC** | **CH4** | **NMHC** | **CO** | **NOx** | **$CO_2$** | **PM** |
| DDC V92 Bug 14 | 1985 | CARB Diesel | 389.62 | 0.66 | 0.05 | 0.61 | 1.72 | 10.79 | 713.74 | 0.20 |
| DDC V92 Bug 2 | 1991 | CARB Diesel | 469.00 | 0.47 | 0.04 | 0.44 | 0.94 | 7.82 | 647.98 | 0.23 |
| DDC Series 60 Bug 6 | 1999 | CARB Diesel | 400.66 | 0.07 | 0.01 | 0.06 | 0.55 | 7.45 | 551.29 | 0.06 |
| CAT 3406B Bug 11 | 1986 | CARB Diesel | 399.32 | 0.15 | 0.03 | 0.12 | 0.68 | 11.32 | 572.27 | 0.09 |
| CAT 3406B Bug 3 | 1991 | CARB Diesel | 402.00 | 0.12 | 0.03 | 0.10 | 0.95 | 10.22 | 613.57 | 0.11 |
| CAT 3412C Bug 7 | Post-96 | CARB Diesel | 730.30 | 0.10 | 0.03 | 0.07 | 1.12 | 7.67 | 606.93 | 0.16 |
| CAT 3406C Bug 9 | Post-96 | CARB Diesel | 469.00 | 0.16 | 0.03 | 0.27 | 1.23 | 6.51 | 546.22 | 0.15 |
| CAT 3406C Bug 10 | 2000 | CARB Diesel | 464.98 | 0.08 | 0.02 | 0.07 | 1.47 | 6.78 | 564.02 | 0.16 |
| CAT 3406C Bug 12 | 2000 | CARB Diesel | 465.86 | 0.09 | 0.02 | 0.07 | 1.04 | 6.61 | 557.20 | 0.14 |
| CUM KTA 19G2 90 Bug 4 | 1990 | CARB Diesel | 477.04 | 0.39 | 0.04 | 0.35 | 0.69 | 7.03 | 546.4 | 0.22 |
| CUM N14 99 Bug 5 | 1999 | CARB Diesel | 470.34 | 0.22 | 0.02 | 0.20 | 0.46 | 6.03 | 586.53 | 0.06 |

**Figure H-1: Average D2 Weighted PM Emission Factors for Baseline Engine Testing**

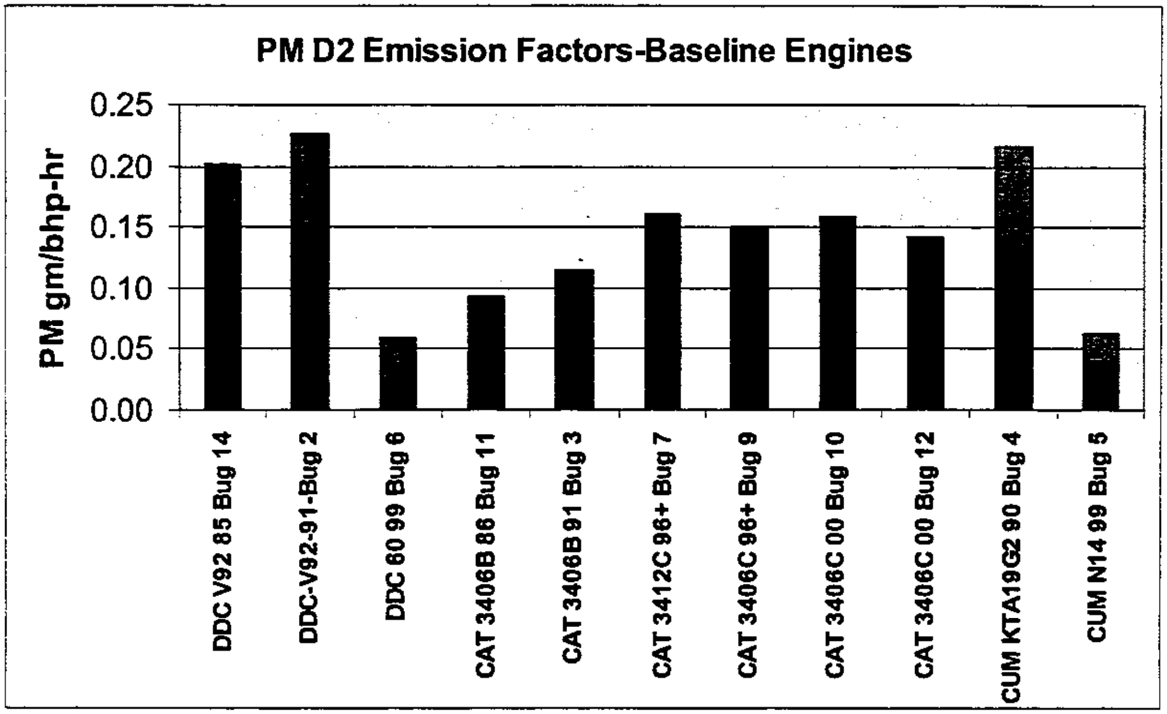
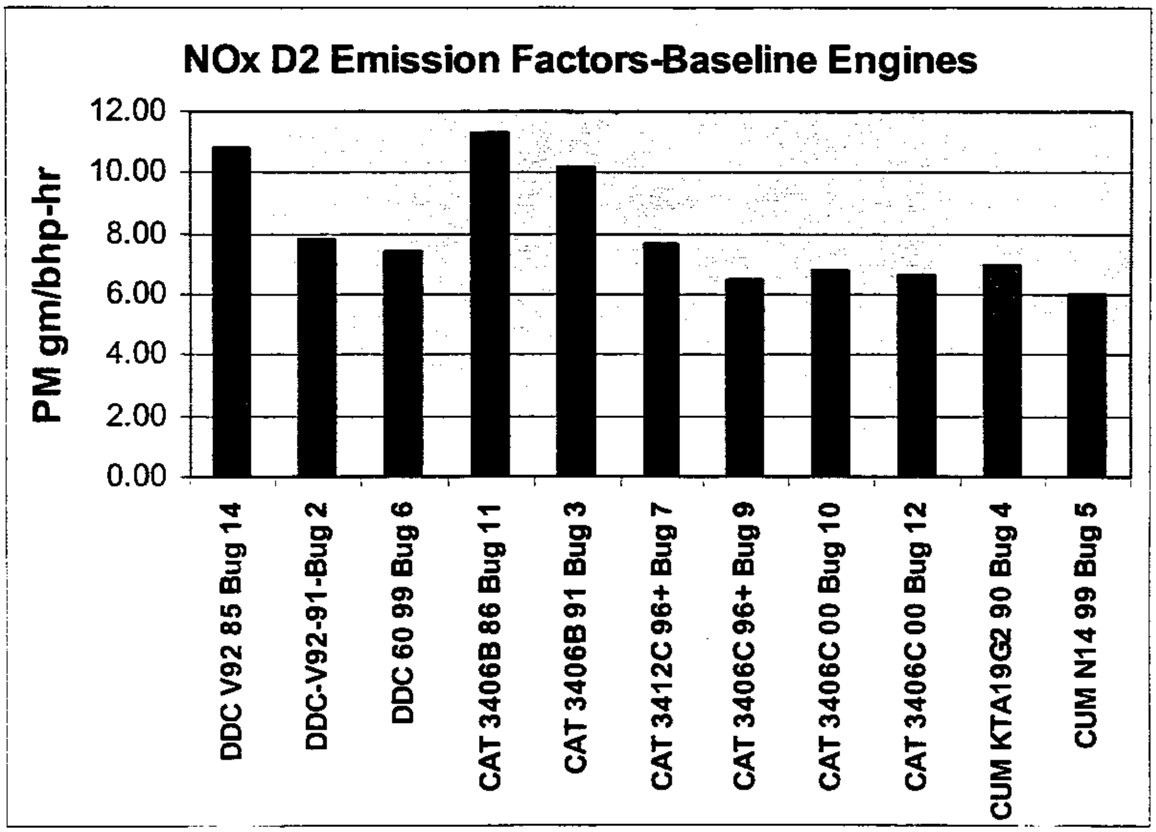



**Figure H-2: Average D2 Weighted NOx Emission Factors for Baseline Engine Testing**



*Control Device Testing:* To measure the initial control efficiency, retrofit engine emissions testing was performed after a 25 hour degreening process for PM and gaseous emissions per ISO 8178. For each of the control devices, average D2 weighted emission factors were measured and control efficiencies were calculated as listed in Table H-6. Following Table H-6, are detailed discussions on each device including a description of the technology and the results of the demonstration study.

**Table H-6: D2 weighted Emission Factors and Control Efficiencies**

| | | Average D2 Weighted Emission Factors (gm/bhp-hr) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Configuration** | **Fuel** | **100% Load (HP)** | **THC** | **$CH_4$** | **NMHC** | **CO** | **NOx** | **PM** |
| 2000 CAT 3406C with Johnson Matthey CRT Passive DPF | | | | | | | | |
| Baseline | CARB Diesel | 465.9 | 0.087 | 0.015 | 0.074 | 1.041 | 6.608 | 0.142 |
| Controlled | ULSD | 467.1 | 0.007 | 0.003 | 0.004 | 0.228 | 6.212 | 0.012 |
| Percent Reductions | | | 92.3 | 82.6 | 94.1 | 78.1 | 6.0 | 91.4 |
| 2000 CAT 3406C with ECS Sequentially Regenerated Combifilter Active DPF | | | | | | | | |
| Baseline | CARB Diesel | 465.0 | 0.082 | 0.017 | 0.067 | 1.468 | 6.783 | 0.159 |
| Controlled | ULSD | 458.8 | 0.050 | 0.015 | 0.037 | 1.645 | 6.042 | 0.0003 |
| Percent Reductions | | | 39.5 | 16.1 | 44.7 | -12.1 | 10.9 | 99.8 |
| 1985 2 stroke Detroit Diesel V92 with CleanAir Systems DOC and CDT Fuel-Borne Catalyst | | | | | | | | |
| Baseline | CARB Diesel | 389.6 | 0.659 | 0.053 | 0.613 | 1.715 | 10.785 | 0.201 |
| Controlled | ULSD+FBC | 389.6 | 0.200 | 0.014 | 0.188 | 0.100 | 11.545 | 0.121 |
| Percent Reductions | | | 69.6 | 73.0 | 69.3 | 94.1 | -7.0 | 40.0 |
| 2000 CAT 3406C with Sud Chemie DOC | | | | | | | | |
| Baseline | CARB Diesel | 465.0 | 0.082 | 0.017 | 0.067 | 1.468 | 6.783 | 0.159 |
| Controlled | CARB Diesel | 467.7 | 0.011 | 0.002 | 0.009 | 0.058 | 7.168 | 0.129 |
| Percent Reductions | | | 86.7 | 90.3 | 85.9 | 96.0 | -5.7 | 18.8 |
| 1985 2 stroke Detroit Diesel V92 with Sud Chemie DOC | | | | | | | | |
| Baseline | CARB Diesel | 389.6 | 0.659 | 0.053 | 0.613 | 1.715 | 10.785 | 0.201 |
| Controlled | CARB Diesel | 393.5 | 0.307 | 0.022 | 0.288 | 0.206 | 10.860 | 0.107 |
| Percent Reductions | | | 53.4 | 58.2 | 53.1 | 88.0 | -0.7 | 46.9 |
| 1986 CAT 3406B with Emulsified Diesel | | | | | | | | |
| Baseline | CARB Diesel | 399.3 | 0.147 | 0.027 | 0.124 | 0.679 | 11.321 | 0.093 |
| Controlled | Emulsified Fuel | 363.1 | 0.161 | 0.026 | 0.139 | 0.496 | 10.914 | 0.076 |
| Percent Reductions | | | -9.7 | 2.4 | -12.0 | 27.0 | 3.6 | 17.8 |
| Post- 96 CAT 3406C with Emulsified Diesel | | | | | | | | |
| Baseline | CARB Diesel | 469.0 | 0.163 | 0.031 | 0.270 | 1.234 | 6.512 | 0.150 |
| Controlled | Emulsified Fuel | 469.0 | 0.131 | 0.027 | 0.108 | 0.820 | 5.563 | 0.041 |
| Percent Reductions | | | 19.4 | 13.1 | 60.0 | 33.6 | 14.6 | 72.7 |

Active DPF

The Lubrizol-Engine Control Systems (ECS) electrically regenerated Combifilter was retrofitted on a model year (MY) 2000 Caterpillar 3406C generator. This control system includes three silicon carbide diesel particulate filters with an electrical regeneration system designed to provide continuous PM control. The triple filter system provides uninterrupted emission filtration during regeneration by switching the exhaust flow between filters. The regeneration system was electronically controlled and entirely automatic. The main components of the system are the ceramic wall-flow filter elements, electronic control unit (ECU), electrical heater system, compressed air blower system and valve system to switch the exhaust flow between filters. The system provides online regeneration by isolating one filter at a time from the exhaust stream to allow for electrical regeneration of that filter. The filter is regenerated by electrical heating combined with a low flow of compressed air. Upon completion of the regeneration cycle, the filter is brought back online for operation. The system operates in two modes: a soot cycle where all three filters are open to exhaust and a regeneration mode where one filter is isolated for regeneration. These two cycles continue throughout operation, sequentially regenerating one filter during each regeneration cycle. This design provides continuous filtration, with regeneration automated by the timed control system.

Because the system operates in two distinct modes, soot and regeneration, 5-mode emission testing was performed in triplicate for both modes. The average emission factors, listed in Table H-6, were calculated using modal data from all soot and regeneration modes. The emission test results show a greater than 99 percent reduction in PM. In addition, NMHC were reduced by approximately 45 percent and NOx by 10 percent. While the particulate matter reduction was very high, this system had two areas of concern. First, backpressure levels measured during durability were higher than anticipated. During the durability cycling, average backpressure was measured at approximately 50 inches $H_2O$ at 65 and 85 percent loads, with a maximum of approximately 70 inches $H_2O$. This unit was originally designed for a smaller two-stroke Detroit Diesel engine. The manufacturer attributes the higher than anticipated backpressure to differences in engine exhaust flows and exhaust hardware between the Detroit Diesel and the Caterpillar 3406C engine. The manufacturer indicated that this was a sizing issue that would be addressed during the design phase of stationary source retrofitting.

The second issue concerned the regeneration control system. The regeneration control system initially had functional problems, which were corrected. Additionally, CE-CERT testing staff found that during the intermittent cold start portion of durability cycling, the soot mode (all three filters open) was longer than had been indicated by the manufacturer. The result may be that the filters are not regenerating as often as described during cold start operation. We believe this may be a due to interruption of the control cycle during intermittent use. This may be an additional source of system backpressure. Since the regeneration system is controlled strictly by timing and not by backpressure sensors, this control scheme may need optimization for applications with multiple cold starts. The manufacturer has indicated that both backpressure and regeneration cycling can be addressed and corrected within the control system design.

Passive DPF

The Johnson Matthey Continuously Regenerating Trap (CRT) was retrofitted on a MY2000 Caterpillar 3406C diesel generator. This is a passive, self-regenerating catalyzed diesel particulate filter. The CRT particulate filter is a patented emission control technology that contains a platinum-coated catalyst and a ceramic monolith particulate filter designed to control particulate matter (PM), carbon monoxide (CO) and hydrocarbon (HC) emissions through catalytic oxidation and filtration. The CRT is a trade name for a two-stage catalytic, passive filter configuration. The CRT system utilizes a ceramic wall-flow filter to trap particulates. The trapped particulate matter is continuously oxidized by nitrogen dioxide generated in an oxidation catalyst, which is placed upstream of the filter. The catalyst promotes the conversion of the NO in the exhaust to $NO_2$ in the first stage of the trap. The reverse process occurs in the subsequent particulate trap. The liberated oxygen atom burns the carbon in the particulate trap resulting in continuous regeneration at lower exhaust temperatures than are required for an uncatalyzed filter. The CRT requires low sulfur fuel.

The formation of $NO_2$ may problematic, since $NO_2$ levels for verified control devices are limited to 20 percent of the total engine baseline NOx emissions, as of January 1, 2003. Initial emission testing of the JM CRT resulted in control efficiencies just below 85 percent. A leak in the seal around the ceramic monolithic filter and housing was located and repaired and durability cycling began. Durability cycling was stopped after it was decided to retest the control efficiencies. After repairing the seal and retesting, the control efficiency was measure at 91 percent for PM and 94 percent for NMHC. The results of the retest are listed in Table H-6. In addition, hydrocarbons and carbon monoxides are also reduced significantly. NOx is reduced slightly, but the fraction of $NO_2$ increased. The controlled level of $NO_2$ is 25 percent of the total baseline NOx level, higher than the verification limit of 20 percent.

Diesel Oxidation Catalyst

The Sud-Chemie diesel oxidation catalyst (DOC 1) was retrofitted on a MY2000 Caterpillar 3406C and a MY1985 2 stroke Detroit Diesel V92. The SC-DOC contains a proprietary catalyst designed promote chemical oxidation of CO and HC as well as the SOF portion of diesel particulate while mitigating the oxidation of fuel sulfur to form sulfate particulate. Because of the selective catalyst formation, low sulfur diesel fuel is not required. Initial control device testing on the Caterpillar 3406C resulted in PM reductions of 18 percent, lower than originally anticipated. To investigate, Thermal/Optical Reflectance tests were performed on PM samples captured on parallel quartz filters to quantify the ratio of elemental carbon to organic carbon (EC/OC). The data indicated that the PM had a high ratio of EC/OC. Since diesel oxidation catalysts reduce the soluble organic fraction of the PM, the high ratio of elemental carbon may explain why the DOC efficiency was lower than originally expected. The DOC was also retrofitted on a MY1985 two stroke Detroit Diesel V92 and emission tested. The measured control efficiency was better than 46 percent for PM and 53 percent for NMHC. EC/OC ratios were lower, indicating a higher component of organic carbon species in the PM. Because of the additional testing, durability and post- durability emission testing was not performed for this control.

Diesel Oxidation Catalyst with Fuel-Borne Catalyst

The CleanAIR Flow Through Filter System was retrofitted on a MY1985 2-stroke Detroit Diesel V92. This system was projected to reduce PM by 50 percent without increasing $NO_2$ emissions. This system is a passive, flow-through-filter (FTF) combined with a Clean Diesel Technology (CDT) fuel borne catalyst to reduce diesel particulate emissions. A diesel oxidation catalyst (DOC), also part of the system, reduces CO and HC emissions. This system experienced regeneration problems during degreening operation (no load operation for 25 hours). The exhaust temperatures were not sufficient for regeneration and the flow-through-filter clogged. The flow-through-filter was removed and the DOC, combined with the fuel-borne catalyst was tested. The control efficiency of the DOC and FBC system was 40 percent for PM and 69 percent for NMHC, while NOx increased by approximately 7 percent. The conditional durability cycling of 168 hours for the DOC/FBC system is almost completed, indicating no durability problems, to date. Post- conditional-durability controlled emissions will be performed upon completion of durability.

Emulsified Fuel

Emulsified fuel testing was performed on two engines, a MY1986 Cat 3406B and a post- 96 CAT 3406C. Chevron Proformix fuel is a water emulsified diesel fuel that consists of a blend of water, conventional diesel fuel and an additive package, utilizing Lubrizol's PuriNOx technology. Small amounts of the additive package are added to the fuel to maintain the emulsion, enhance cetane and lubricity, inhibit corrosion, protect against freezing and prevent foaming. The water is suspended in droplets within the fuel lowering PM emissions by creating a leaner fuel environment in the engine. Also, the emulsified fuel creates cooling effect in the combustion chamber, thereby, decreasing NOx emissions. The formulation contains 77 percent diesel fuel, 20 percent water, and 3 percent additive package. Emissions testing of the CAT 3406B with emulsified fuel demonstrated PM reductions of 17 percent and NOx reductions of 3 percent. For the CAT 3406C, PM was reduced by 72 percent and NOx was reduced by approximately 14 percent. These varied results indicate that reductions may be dependent on engine design and combustion conditions and require further study.

Particulate Filter with Fuel-Borne Catalyst

The Catalytic Exhaust Products SXS-B/FA diesel particulate filter is an uncatalyzed ceramic wall flow filter combined with Clean Diesel Technology fuel-borne catalyst. It is planned for installation on a MY2000 Caterpillar 3406C diesel generator. This system combines a ceramic monolith trap with a Clean Diesel Technology fuel-borne catalyst to facilitate regeneration of diesel particulate filter. The bare wall flow diesel particulate filter requires a minimum exhaust gas temperature of approximately 550 to 600 °C for 20 percent of operation in order for the particulate filter to regenerate properly. Addition of fuel borne catalysts assist in regeneration and allow the diesel particulate filter to regenerate at exhaust temperatures in the range of 320 to 350+ °C. Installation and emission testing for this system has not been completed, but is planned for late 2003.

## IV. Discussion

*Diesel Particulate Filters:* Both active and passive diesel particulate filters were tested for backup generator applications. Control efficiency for both technologies were better than 90 percent. The technologies were capable of regenerating under the intermittent cold start maintenance cycling and loaded operation, typical for backup generators. While the passive CRT DPF did have increased levels of $NO_2$, overall NOx levels decreased by approximately 6 percent. The actively regenerating system showed better than 99 percent reduction for PM, with regeneration independent of exhaust temperature by design. Issues involving high backpressure levels and active regeneration control design need to be addressed during system design for stationary sources. The results from the demonstration testing indicate that both active and passive technologies are effective in reducing PM better than 85 percent. Durability testing for intermittent cold start and extended high load operation indicates that these technologies may be effective for other steady-state stationary engine applications, as well. The technologies are currently commercially available for retrofit applications.

*Diesel Oxidation Catalysts:* The effectiveness of diesel oxidation catalysts reportedly depends on the level of soluble organic fraction in the PM. Comparison testing on two engines showed that for low ratios of organic PM components, PM control effectiveness was lower than anticipated. (CE-CERT, 2003) Where the ratio of organic components was higher, the control efficiency increased significantly. Testing of two commercially available DOC technologies on a two stroke Detroit Diesel V92 showed control efficiencies in the range of 40 to 46 percent for PM and 53 to 69 for NMHC. NOx levels increased 1 to 7 percent. The NOx increases may be due to differences in ambient conditions during testing and are well below the limits included in the Verification Procedure. Demonstration testing indicates that DOC technologies are effective in providing better than 30 percent control efficiency for appropriate engine types.

*Emulsified Fuel:* Testing of emulsified fuels for two different Caterpillar engines resulted in a wide range of control efficiency for PM from 17 to 72 percent. Control efficiencies for NMHC were even more varied, ranging from a decrease of 60 percent to an increase in 12 percent. For both tests, NOx reductions ranged from 3 to 14 percent. These wide variations in test results indicate that further testing is required. Results also show that for certain engine types, emulsified fuel could be a very effective technology to reduce PM significantly, while also providing reductions in NOx.

**Figure H-3. Average D2 Weighted PM Emission Factors for Baseline and Controlled Engine Testing**

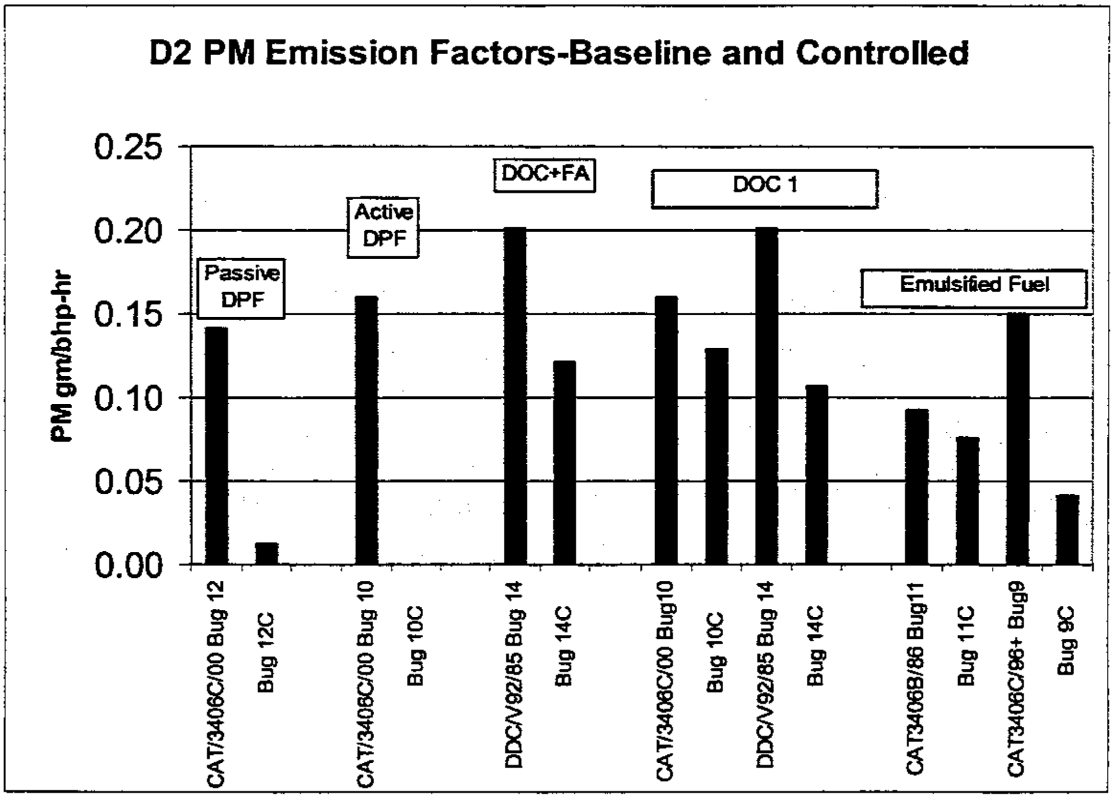



**Figure H-4: Average D2 Weighted NOx Emission Factors for Baseline and Controlled Engine Testing**

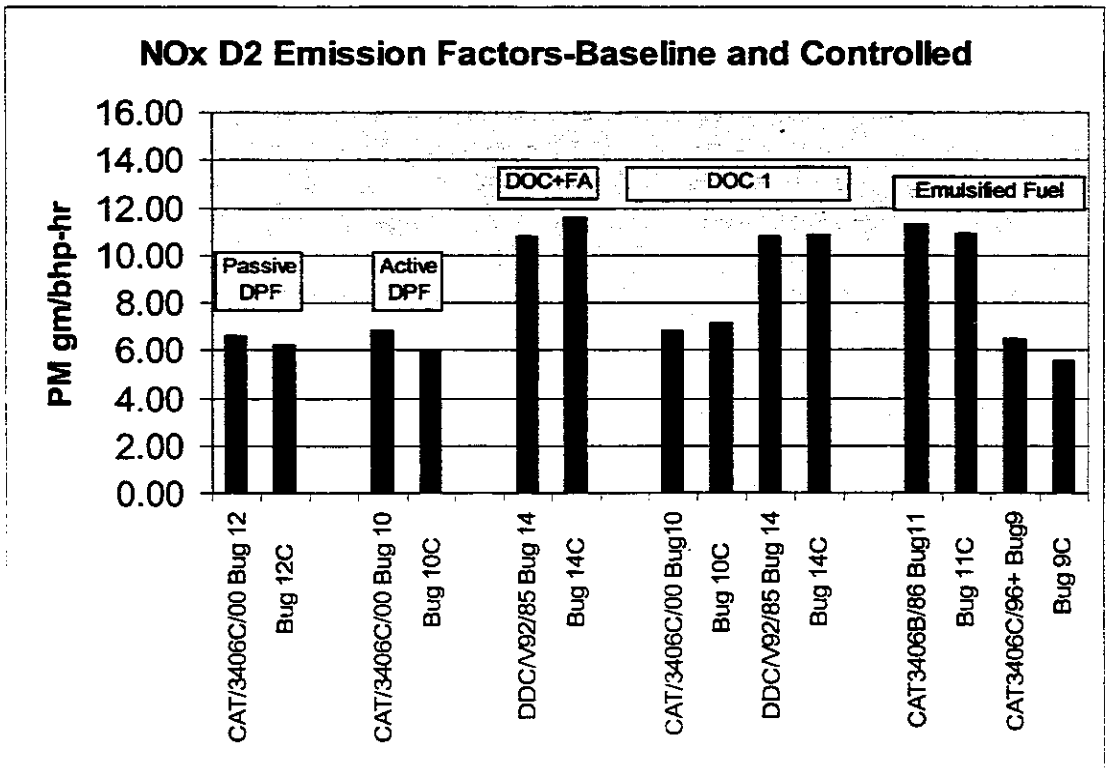
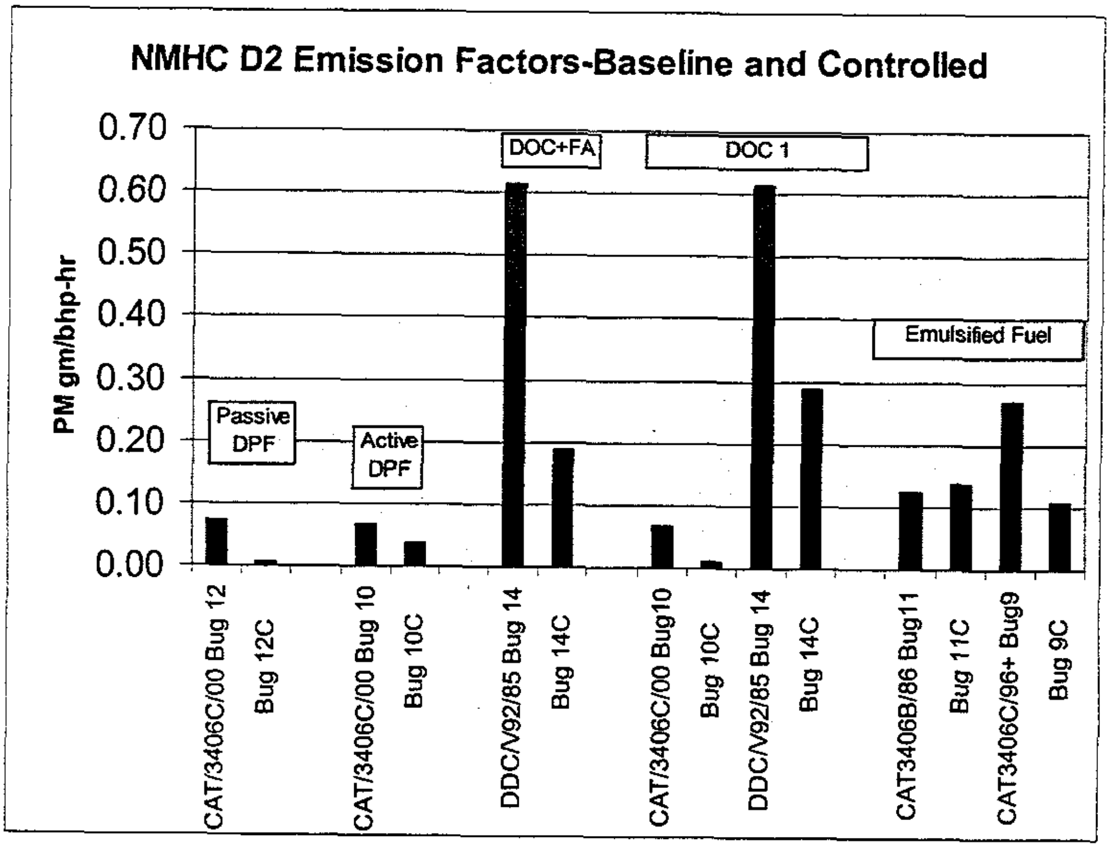


**Figure H-5: Average D2 Weighted NMHC Emission Factors for Baseline and Controlled Engine Testing**



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California Energy Commission. *Inventory of Backup Generators in the State of California*, Pier Report P500-01-027; December 2001. (CEC, 2001)

International Organization for Standardization. *RIC Engines-Exhaust emission measurement* ISO/DP 8178 Test Procedure, Part 1, June 3, 1992, Part 4, June 30, 1992, and Part 5, June 3, 1992. (ISO/DP 8178, 1992)

California Air Resources Board. *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines*, Chapter 14, Title 13, California Code of Regulations, sections 2700 through 2710. Adopted May 16, 2002. (ARB, 2002)

Standards for Diesel Fuel, Title 13, California Code of Regulations, sections 2281 and 2282. (CCR Title 13, Sections 2281, 2282)

Presentation by Wayne Miller, University of California, Riverside, Center for Environmental Research and Testing, *Conduct Field Tests of BUGs Units and Controls*, California Energy Commission Backup Generators Advisory Committee Meeting, November 14, 2001. (CE-CERT, 2001)

Presentation by Wayne Miller, University of California, Riverside, Center for Environmental Research and Testing, *The California Demonstration Program for Control of PM from Diesel Backup Generators*, U.S. Department of Energy's 9th Diesel Engine Emissions Reductions Conference, Newport, Rhode Island, August 24-28, 2003. (CE-CERT, 2003)

# Appendix I

# Cost Analysis - Basis for Calculations

## I. Capital Cost Estimates of Diesel Emission Controls and Purchase of New Engines

The estimated capital costs ($/hp) for installation of a DPF was derived from actual costs for DPF installations in California. Table I-1 lists 16 of the 49 known installations of DPFs on emergency generators in California. These 16 were chosen because cost information was available. Most of this information was used to develop equations relating the size of the generator to the cost of the DPF. However, four of these 16 installations (indicated in italics in Table I-1 below) were not used in the development of the equations due to questionable cost data, or because the cost included additional equipment not related to the DPF. Table I-2 lists the 12 emergency diesel engines with a DPF actually used to relate engine size to DPF costs. Figures I-1 graphically represents this relationship and the resulting trend line and equation in terms of total DPF costs and installation costs. These equations are used to calculate the values presented in Chapter IX, Tables IX-4, IX-5, IX-9, IX-11, IX-13, IX-14, and IX-16.

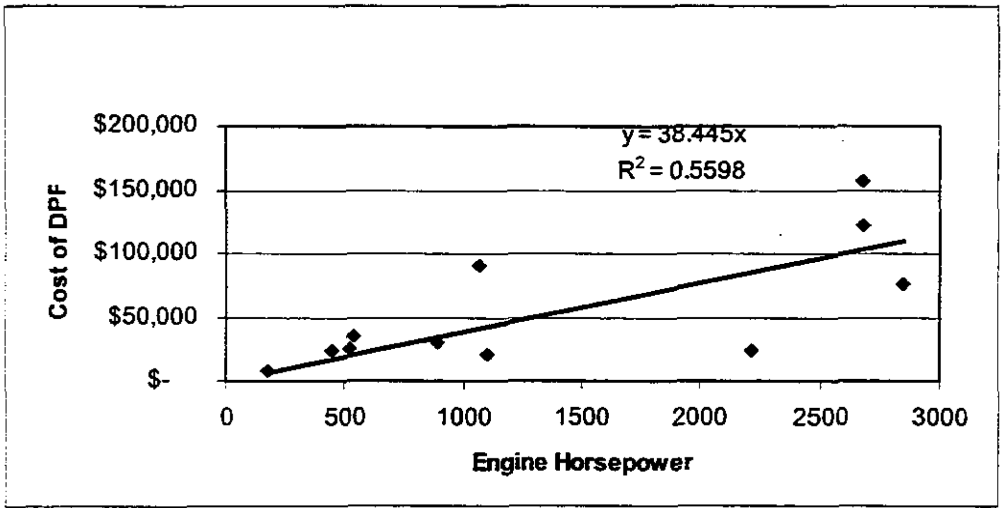
**Table I-1: List of Emergency Generators with Installed Diesel Particulate Filters and Available Cost Information**

| | | Engine | | | DPF | | | Engine |
|---|---|---|---|---|---|---|---|---|
| Obs | Facility Type | Make | Model | HP | Age | Capital | Install | Price |
| 1 | Public Works | Caterpillar | 3516B | 2848 | 2001 | $ 76,000 | | $317,002 |
| 2 | Medical Center | Caterpillar | | 2680 | 2001 | $121,750 | $ 35,000 | $616,250 |
| 3 | Candy Company | Caterpillar | 3516 B | 2680 | 2001 | $ 74,500 | $ 47,000 | $288,000 |
| *4* | *Communication* | *Caterpillar* | *3516* | *2479* | *1993* | *$100,000* | | |
| *5* | *Communication* | *Caterpillar* | *3516* | *2479* | *1993* | *$100,000* | | |
| *6* | *Communication* | *Caterpillar* | *3516* | *2479* | *1993* | *$100,000* | | |
| 7 | Data | Cummins | KTTA 50-G2 | 2220 | 1997 | $ 24,000 | | |
| *8* | *Communication* | *Cummins* | *KTA50-G9* | *2200* | *2001* | *$ 10,000* | | |
| 9 | Brewery | Caterpillar | 3412 DISTA | 1100 | 1999 | $ 20,000 | | |
| 10 | Data | Caterpillar | | 1072 | 2001 | $ 90,000 | | |
| 11 | Communication | Caterpillar | 3412C | 896 | 2000 | $ 20,000 | $ 10,000 | $ 90,000 |
| 12 | Data | Caterpillar | | 536 | 2001 | $ 35,000 | | |
| 13 | Medical Center | Caterpillar | 3406 | 519 | 2002 | $ 26,000 | | |
| 14 | Communication | Caterpillar | 3406 | 449 | 2000 | $ 20,000 | $ 3,600 | $ 50,000 |
| 15 | Hotel | Caterpillar | | 175 | Soon | $ 8,500 | | |
| 16 | Hotel | Caterpillar | | 175 | Soon | $ 8,500 | | |

**Table I-2: List of Emergency Generators with Installed Diesel Particulate Filters and Useful Cost Information**

| | | Engine | | | | DPF | | |
|---|---|---|---|---|---|---|---|---|
| **Obs** | **Facility Type** | **Make** | **Model** | **HP** | **Age** | **Capitol** | **Install** | **Total** |
| 1 | Public Works | Caterpillar | 3516B | 2848 | 2001 | $ 76,000 | | $ 76,000 |
| 2 | Medical Center | Caterpillar | | 2680 | 2001 | $121,750 | $ 35,000 | $156,750 |
| 3 | Candy Company | Caterpillar | 3516 B | 2680 | 2001 | $ 74,500 | $ 47,000 | $121,500 |
| 7 | Data | Cummins | KTTA 50-G2 | 2220 | 1997 | $ 24,000 | | $ 24,000 |
| 9 | Brewery | Caterpillar | 3412 DISTA | 1100 | 1999 | $ 20,000 | | $ 20,000 |
| 10 | Data | Caterpillar | | 1072 | 2001 | $ 90,000 | | $ 90,000 |
| 11 | Communication | Caterpillar | 3412C | 896 | 2000 | $ 20,000 | $ 10,000 | $ 30,000 |
| 12 | Data | Caterpillar | | 536 | 2001 | $ 35,000 | | $ 35,000 |
| 13 | Medical Center | Caterpillar | 3406 | 519 | 2002 | $ 26,000 | | $ 26,000 |
| 14 | Communication | Caterpillar | 3406 | 449 | 2000 | $ 20,000 | $ 3,600 | $ 23,600 |
| 15 | Hotel | Caterpillar | | 175 | Soon | $ 8,500 | | $ 8,500 |
| 16 | Hotel | Caterpillar | | 175 | Soon | $ 8,500 | | $ 8,500 |

**Figure I-1: Existing California DPF Total Costs**



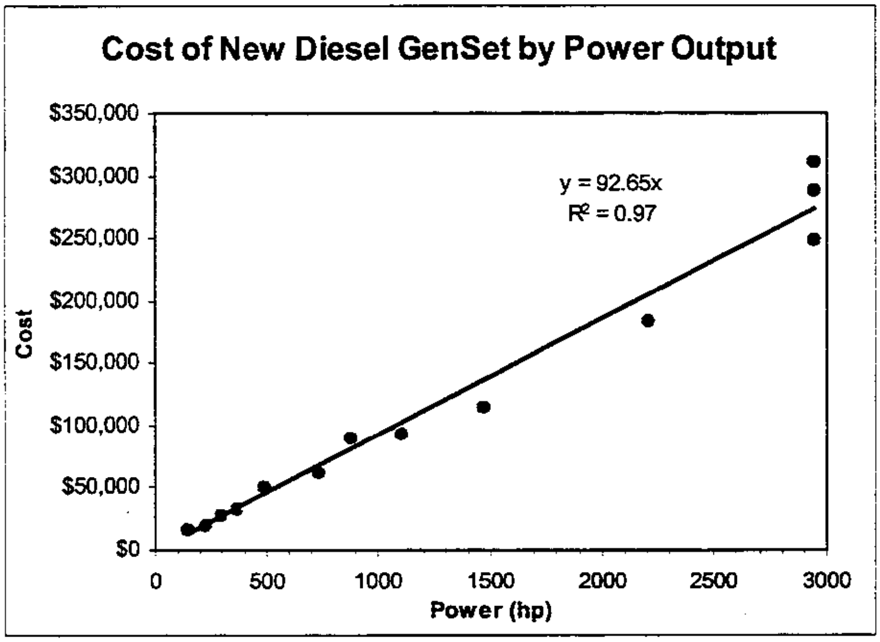

Based on this regression, we estimate the costs for DPFs to be approximately $38 dollars per horsepower.

The estimated capital costs ($/hp) for a the purchase of new diesel engine was derived from actual costs for diesel generators installed in California and calling dealerships. Table I-3 lists costs of diesel generators of various sizes in California. This information was used to develop an equation relating the size of the generator to the cost. Figure I-2 graphically represents this relationship and the resulting trend line and equation in terms of total generator costs versus power output. These equations are used to calculate the values presented in Chapter IX.

**Table I-3: List of New Diesel Generators Costs**

| Manufacturer | kW | HP | Price |
|---|---|---|---|
| Cummins | 100 | 147 | $ 16,000 |
| Cummins | 150 | 221 | $ 20,000 |
| Cummins | 200 | 295 | $ 28,000 |
| Cummins | 250 | 368 | $ 33,000 |
| Caterpillar | 335 | 493 | $ 50,000 |
| Cummins | 500 | 736 | $ 62,000 |
| Caterpillar | 600 | 884 | $ 90,000 |
| Cummins | 750 | 1104 | $ 93,000 |
| Cummins | 1000 | 1473 | $ 115,000 |
| Cummins | 1500 | 2209 | $ 183,000 |
| Cummins | 2000 | 2945 | $ 248,000 |
| Caterpillar | 2000 | 2945 | $ 288,000 |
| Caterpillar | 2000 | 2945 | $ 311,380 |

**Figure I-2: New Generator Costs in California**




Based on this regression, we estimate the costs for new diesel generators to be approximately $92.65 dollars per horsepower.

## II. Summary of In-use Diesel Fueled Stationary Engine Population and Costs

Table I-4 summarizes the stationary in-use diesel engine statistics and associated costs. Data for both private and public engine ownership is provided. The public engines are further subcategorized by local, State, and federal owned. The numbers in this table with parenthesis around them are negative values representing cost savings. All the values are combined emergency standby (E/S) and prime engines unless otherwise indicated.

**Table I-4: Population and Cost for In-Use Diesel-Fueled Engines**

| Category | Summary of Total In-Use Engines | | | | | |
|---|---|---|---|---|---|---|
| | All | Private | Public | Local | State | Federal |
| State Wide Installation Cost ($) | $ 45,990,000 | $ 35,950,000 | $ 10,740,000 | $ 6,350,000 | $ 750,000 | $ 3,640,000 |
| Annual Maintenance & Fuel Cost ($) | $ (52,000) | $ 691,000 | $ (32,000) | $ 4,000 | $ (100,000) | $ 41,000 |
| Annualized Cost ($) | $ 7,757,000 | $ 6,672,000 | $ 1,511,000 | $ 1,025,000 | $ 13,000 | $ 632,000 |
| Annualized E/S Cost ($) | $ (679,000) | $ 33,000 | $ (99,000) | $ (36,000) | $ (97,000) | $ 14,000 |
| Annualized Prime Cost ($) | $ 8,437,000 | $ 6,640,000 | $ 1,610,000 | $ 1,062,000 | $ 109,000 | $ 619,000 |
| # of Engines retrofitted | 1,559 | 1,211 | 348 | 212 | 26 | 109 |
| # of E/S Engines retro | 232 | 167 | 65 | 45 | 9 | 12 |
| # of Prime Engines retro | 1,327 | 1,044 | 283 | 167 | 17 | 98 |
| Population of Engines | 20,987 | 10,796 | 10,191 | 5,600 | 899 | 3,692 |
| Pop. of E/S Engines | 19,660 | 9,752 | 9,908 | 5,432 | 882 | 3,594 |
| Pop. of Prime Engines | 1,327 | 1,044 | 283 | 167 | 17 | 98 |
| Local Ann. Cost Inspect | $ 378,500 | $ 226,300 | $ 152,100 | $ 84,600 | $ 12,800 | $ 54,700 |

## III. Statewide Annual and Total Costs for Businesses

Table I-5 presents the estimated statewide costs to business having prime and emergency standby engines. The categories are in-use emergency standby and prime, new emergency standby and prime, and new agriculture.

**Table I-5: Statewide Annual Costs**

| Equipment Category | | Total Capital Cost ($) | Annualized Capital Cost ($) | Annual Recurring Costs ($) | Total Annualized Cost ($) |
|---|---|---|---|---|---|
| In-use | Prime | $ 33,652,844 | $ 5,965,565 | $ 674,066 | $ 6,639,630.00 |
| | E/S | $ 2,296,060 | $ 162,911 | $ -130,132 | $ 32,779 |
| New | Prime | $ 529,765 | $ 75,427 | $ 417 | $ 75,844 |
| | E/S | | | $ 7,431 | $ 7,431 |
| | Agriculture | | | $ 2,120 | $ 2,120 |
| Total | | $ 36,478,669 | $ 6,203,902 | $ 553,902 | $ 6,757,805 |

## IV. Stationary Prime Diesel Engines Assumptions

Table I-6 lists the statewide in-use prime engine information used as the basis for calculating the costs and PM emissions. For in-use prime engines, 80% of the engine population is assumed to be retrofitted with an 85% emission reduction device, while the remaining 20% are assumed to retrofit their engines to meet a 30% emission reduction and then purchase a new engine meeting Tier IV requirements in 2011. For example, for 50-175 horsepower, low use engines shown in Table I-6 below, 169 of 211 engines are expected to be retrofitted to achieve an 85% reduction, and 42 are expected to be retrofitted to achieve a 30% reduction, with and engine replacement in 2011.

**Table I-6: Statewide In-use Prime Engine Size, Use, and PM Emissions Rate Characteristics**

| State Inventory = | 1327 | 2002 inventory DEPICT | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Prime Engines | | | | | | | | |
| HP Range | 0-500 hrs =Low Use or 500+ =High use | # Engines | Avg. Size (hp) | Load | Avg. Annual Hours | Current PM (g/bhp-hr) | New PM (g/bhp-hr) | Reduction Required |
| 50-175 | Low Use | 169 | 127 | 0.50 | 103 | 0.55 | 0.0825 | 85% |
| 50-175 | Low Use | 42 | 127 | 0.50 | 103 | 0.55 | 0.385 | 30% |
| 50-175 | Low Use | 42 | 127 | 0.50 | 103 | 0.55 | 0.01 | New Eng after 2011 |
| 50-175 | High Use | 115 | 118 | 0.32 | 1246 | 0.5 | 0.075 | 85% |
| 50-175 | High Use | 29 | 118 | 0.32 | 1246 | 0.5 | 0.35 | 30% |
| 50-175 | High Use | 29 | 118 | 0.32 | 1246 | 0.5 | 0.01 | New Eng after 2011 |
| 175-750 | Low Use | 230 | 321 | 0.61 | 132 | 0.38 | 0.057 | 85% |
| 175-750 | Low Use | 57 | 321 | 0.61 | 132 | 0.38 | 0.266 | 30% |
| 175-750 | Low Use | 57 | 321 | 0.61 | 132 | 0.38 | 0.01 | New Eng after 2011 |
| 175-750 | High Use | 264 | 413 | 0.45 | 1519 | 0.38 | 0.057 | 85% |
| 175-750 | High Use | 66 | 413 | 0.45 | 1519 | 0.38 | 0.266 | 30% |
| 175-750 | High Use | 66 | 413 | 0.45 | 1519 | 0.38 | 0.01 | New Eng after 2011 |
| 750+ | Low Use | 47 | 1187 | 0.49 | 71 | 0.3 | 0.045 | 85% |
| 750+ | Low Use | 12 | 1187 | 0.49 | 71 | 0.3 | 0.21 | 30% |
| 750+ | Low Use | 12 | 1187 | 0.49 | 71 | 0.3 | 0.01 | New Eng after 2011 |
| 750+ | High Use | 237 | 1492 | 0.60 | 2168 | 0.3 | 0.045 | 85% |
| 750+ | High Use | 59 | 1492 | 0.60 | 2168 | 0.3 | 0.21 | 30% |
| 750+ | High Use | 59 | 1492 | 0.60 | 2168 | 0.3 | 0.01 | New Eng after 2011 |

## V. Stationary Emergency Standby Diesel Engines Assumptions

Table I-7 lists the statewide in-use emergency standby engine information used as the basis for calculating the costs and PM emissions. As shown, the estimated PM emission rate varies with the age of the engine, and its horsepower rating.

**Table I-7: Statewide In-use Emergency Standby Engine Population, Size, and PM Emissions Rate Characteristics**

| Model Year Range | Horsepower Range | # Engines | Average HP | Existing PM Emission Rate (g/bhp-hr) |
|---|---|---|---|---|
| Pre 1987 | <=250 | 2597 | 140 | 0.55 |
| Pre 1987 | >250 | 3883 | 613 | 0.53 |
| 1988-2002 | <=250 | 5177 | 131 | 0.38 |
| 1988-1995 | 250<=750 | 2456 | 416 | 0.38 |
| 1988-1999 | >750 | 3149 | 1224 | 0.38 |
| 1996-2001 | 250<=750 | 1624 | 423 | 0.15 |
| 2000-2002 | >750 | 709 | 1674 | 0.15 |
| 2002 | 250<=750 | 66 | 409 | 0.12 |

## VI. Annual Cost Effectiveness

Table I-8 lists the estimated statewide annual costs, PM emissions reduced (based on the ARB emissions inventory), and resulting cost effectiveness. The figures are provided for 2005 through 2020, and vary with the implementation of the various regulatory provisions for different types of stationary diesel engines.

**Table I-8: Statewide Annual Costs, PM Reduced, and Resulting Cost Effectiveness**

| Year | Sum Annual Costs ($) | Inventory Based PM Reduced | Cost Effectiveness | |
|---|---|---|---|---|
| | | (tons/yr) | ($/tons) | ($/lb) |
| 2005 | $ 1,354,316 | 145 | $ 8,043 | $ 4.02 |
| 2006 | $ 3,108,844 | 125 | $ 20,391 | $ 10.20 |
| 2007 | $ 4,693,204 | 114 | $ 32,388 | $ 16.19 |
| 2008 | $ 6,119,622 | 103 | $ 44,179 | $ 22.09 |
| 2009 | $ 5,842,752 | 93 | $ 44,416 | $ 22.21 |
| 2010 | $ 5,578,374 | 73 | $ 51,459 | $ 25.73 |
| 2011 | $ 5,409,320 | 76 | $ 45,996 | $ 23.00 |
| 2012 | $ 5,159,407 | 68 | $ 46,636 | $ 23.32 |
| 2013 | $ 4,135,495 | 61 | $ 39,895 | $ 19.95 |
| 2014 | $ 3,197,399 | 54 | $ 33,069 | $ 16.53 |
| 2015 | $ 2,358,752 | 51 | $ 24,349 | $ 12.17 |
| 2016 | $ 1,592,726 | 42 | $ 19,248 | $ 9.62 |
| 2017 | $ 1,336,349 | 36 | $ 17,636 | $ 8.82 |
| 2018 | $ 1,100,777 | 32 | $ 15,999 | $ 8.00 |
| 2019 | $ 900,639 | 27 | $ 14,566 | $ 7.28 |
| 2020 | $ 717,067 | 23 | $ 12,874 | $ 6.44 |
| | | Weighted Average = | $ 30,821 | $ 15.41 |

Table I-9 presents another cost effectiveness based on the reduction in reactive organic gases (ROG) and oxides of nitrogen (NOx) combined. The total statewide annual costs were split evenly between PM and ROG+NOx, such that half of the total statewide annual costs were used along with the associated ROG+NOx reductions. As shown in Table I-9, the resulting cost effectiveness value of the years 2005-2020 is $0.92 per pound of ROGF+NOx reduced. The resulting PM cost effectiveness (which is not shown in Table I-9) is simply half the value presented in Table I-8, or $7.70 per pound of PM reduced.

**Table I-9: Statewide Annual Costs, ROG and NOx Reduced, and Resulting Cost Effectiveness**

| Year | Sum Annual Costs ($) | Inventory Reduced | | | ROG+NOx Cost Effectiveness | |
|---|---|---|---|---|---|---|
| | | ROG (tons/yr) | NOx (tons/yr) | ROG+NOx (tons/yr) | ($/ton) | ($/lb) |
| 2005 | $ 677,158 | 165 | 418 | 583 | $ 1,162 | $ 0.58 |
| 2006 | $ 1,554,422 | 157 | 306 | 463 | $ 3,358 | $ 1.68 |
| 2007 | $ 2,346,602 | 149 | 389 | 538 | $ 4,360 | $ 2.18 |
| 2008 | $ 3,059,811 | 141 | 455 | 596 | $ 5,131 | $ 2.57 |
| 2009 | $ 2,921,376 | 133 | 530 | 663 | $ 4,407 | $ 2.20 |
| 2010 | $ 2,789,187 | 126 | 352 | 478 | $ 5,839 | $ 2.92 |
| 2011 | $ 2,704,660 | 118 | 679 | 796 | $ 3,396 | $ 1.70 |
| 2012 | $ 2,579,704 | 110 | 753 | 863 | $ 2,989 | $ 1.49 |
| 2013 | $ 2,067,748 | 102 | 828 | 930 | $ 2,224 | $ 1.11 |
| 2014 | $ 1,598,699 | 94 | 902 | 997 | $ 1,604 | $ 0.80 |
| 2015 | $ 1,179,376 | 87 | 897 | 983 | $ 1,199 | $ 0.60 |
| 2016 | $ 796,363 | 79 | 1,051 | 1130 | $ 705 | $ 0.35 |
| 2017 | $ 668,174 | 71 | 1,126 | 1197 | $ 558 | $ 0.28 |
| 2018 | $ 550,388 | 63 | 1,200 | 1263 | $ 436 | $ 0.22 |
| 2019 | $ 450,320 | 55 | 1,275 | 1330 | $ 339 | $ 0.17 |
| 2020 | $ 358,533 | 48 | 1,485 | 1532 | $ 234 | $ 0.12 |
| Weighted Average = | | | | | $ 1,834 | $ 0.92 |

## VII. Impacts on Business

To comply with State law, ARB staff evaluated the impacts to a typical business and a typical small businesses. Our analysis is presented below.

Estimated Typical Business Impacts

Many businesses do not own any diesel-fueled stationary engines. Based on the ARB Survey, for those businesses that do have stationary diesel-fueled engines, the average business owns 2.5 emergency standby engines of 700 horsepower, or three prime engines of 560 horsepower.[1] The ARB survey of prime engines had a low response rate. The State inventory average prime engine size is 590 horsepower. Since the survey data and State inventory data are very close, the State inventory average prime engine size was used for the cost calculations.

[1] We believe this may be an overestimate of the number of engines owned by a typical business. Some of the telecommunication businesses own hundreds of engines, which may have biased the average.

According to the data collected, most businesses that own an emergency standby engine will not need to install DECS, and for those that do, the majority can use the less expensive diesel oxidation catalyst. The costs to a business with a typical size emergency standby engine could range from $250 to $16,750. The low end of the cost range reflects businesses that will not have to install retrofits (ie., no equipment cost). The upper end reflects businesses that will retrofit emergency standby engines with DOCs at an average capital cost $6,700 each. Because the average private business that owns an emergency standby stationary diesel-fueled CI engine has 2.5 engines, the potential capital cost to a business is estimated to be $16,750.

If a business owns a prime engine, that doesn't already meet the ATCM requirements, then retrofit with a DPF or DOC would be necessary. According to our survey, the average prime engine owned by a small business is approximately the same horsepower rating (540 hp) as a prime engine owned by a typical business (560 hp). Because this average is fairly close to the average horsepower of a prime engine owned by a small business, we used the overall average horsepower of 590 to simplify our cost analyses. This results in a conservative cost estimate. Therefore, the average capital cost to retrofit a prime engine ($19,200) is approximately the same for a typical business owning a prime engine or a small business owning a prime engine. Since a typical business owning a prime engine owns 3 of them and a small business owning prime engines has 1.75, the cost ranges from $57,600 to $33,600.

The annual ongoing costs are based on a reporting cost of $100 per engine per year and an estimated per-engine annualized cleaning cost of $1.33/hp engine size every 1,500 hours. This results in annual ongoing costs averaging $100 for emergency standby and $650 for prime per engine per year. Because the average business owns 2.5 emergency standby engines or 3 prime engines, the estimated recurring costs are $250 to $1,950 for businesses that own an emergency standby or prime stationary diesel engine(s).

<u>Estimated Small Business Impacts</u>

The cost to a typical small business is derived from the average size and number of engines owned. Most small businesses in California do not own any diesel-fueled stationary engines. Based on the ARB Survey, for those small businesses that do have stationary diesel-fueled engines, the average small business owns 1.5 emergency standby engines with an average horsepower of 500, and 1.75 prime engines, with an average horsepower of 540. The overall average horsepower for all prime engines reported in the ARB Survey was 590 bhp. Because this average is fairly close to the average horsepower of a prime engine owned by a small business, we used the overall average horsepower of 590 to simplify our cost analyses. Therefore, the average capital cost to retrofit a prime engine ($19,200) is approximately the same for a typical business owning a prime engine or a small business owning a prime engine. This results in a conservative cost estimate.

As with all businesses, most small businesses that own emergency standby diesel-fueled CI engines will not need to install DECS. However, the ARB Survey revealed that small businesses have a higher percentage of older and dirtier engines that may require a control device such as a DOC. Even though a small business emergency standby engine is slightly smaller than a typical business emergency standby engine, the increased age and emission rate may require a slightly more expensive DOC. Staff assumed that the average capital cost to retrofit an emergency standby engine is approximately the same for a typical business owning an emergency standby engine or a small business owning an emergency standby engine. This results in a conservative cost estimate. The costs to a small business with a typical size emergency standby engine could range from $150 to $10,200. The lower end of the range given for "emergency standby" reflects the small businesses with engines not requiring installation of DECS (no equipment cost, only reporting cost). The upper end of the range reflects capital and associated recurring costs for small businesses needing to retrofit 1.5 engines at a cost of $10,200 (average capital cost of $6,700 per engine plus $100 for reporting).

Any prime engine operated by a small business ,that doesn't already meet the ATCM requirements, would require installation of a DECS. Capital costs would range from $11,000 to $147,000. The average small business with a prime engine is expected to have initial costs of about $33,600 based on the average size and number of prime engines owned.

The annual ongoing costs are based on a reporting cost of $100 per engine per year and an estimated annualized DPF cleaning cost of $1.33 per horsepower engine size conducted every 1,500 hours. This results in reporting and cleaning costs averaging $100 for emergency standby engines and $650 for prime engines per engine per year. Because the average small business owns 1.5 emergency standby engines or 1.75 prime engines, the estimated costs range from $150 to $1,134 for small businesses that own an engine or engines. Table I-9 lists the costs identified in sections VII and VIII.

**Table I-9: Estimated Typical and Small Business Retrofit Costs**

| Stationary Engine Category | | Typical # of engines | Average Size | Recurring Costs | Capital Costs per Engine | Total Recurring Costs | Total Capital Costs |
|---|---|---|---|---|---|---|---|
| Typical Business | E/S | 2.5 | 700 | $ 100 | $ 6,700 | $ 250 | $ 16,750 |
| | Prime | 3 | 590 | $ 650 | $ 30,100 | $ 1,950 | $ 90,300 |
| Small Business | E/S | 1.5 | 500 | $ 100 | $ 6,700 | $ 150 | $ 10,050 |
| | Prime | 1.75 | 590 | $ 650 | $ 30,100 | $ 1,138 | $ 52,675 |

# Appendix J

## Air Resources Board Comments to U.S. EPA on the Proposed National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE)

# Air Resources Board

**Alan C. Lloyd, Ph.D.**
**Chairman**
1001 I Street • P.O. Box 2815 • Sacramento, California 95812 • www.arb.ca.gov

**"'inston H. Hickox**
*ency Secretary*

**Gray Davis**
*Governor*


February 20, 2003

Attention: Docket ID No. OAR-2002-0059
EPA West (Air Docket)
U.S. Environmental Protection Agency (MD-6102T)
Room B-108
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

Dear Sir or Madam:

The California Air Resources Board (ARB) staff is providing comments on the proposed National Emission Standards for Hazardous Air Pollutants (NESHAP) for Stationary Reciprocating Internal Combustion Engines (RICE). We have serious concerns with the proposal and request that the RICE NESHAP include a provision to exempt stationary diesel IC engines in California that meet the requirements of California's Stationary Diesel Engine Airborne Toxic Control Measure (ATCM). Our comments, which are briefly summarized below and provided in detail in the attachment to this letter, are directed at the portion of the proposed RICE NESHAP regulating stationary diesel engines.

As you know, the ARB has a long history of successfully implementing effective measures to reduce emissions of air toxics in California. With respect to diesel engines, the ARB has been involved in efforts to reduce the emissions and the associated health impacts of diesel exhaust since the late 1980s. In 1998, the ARB identified diesel particulate matter (PM) as a toxic air contaminant. In September 2000, the ARB adopted the *Diesel Risk Reduction Plan,* an aggressive plan that established a goal of achieving a 75 percent reduction in diesel PM emissions by 2010. Also, in September 2000, the ARB approved the *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines* (Risk Management Guidance). The Risk Management Guidance recommends that catalyzed diesel particulate filters (DPFs) be required for all new prime (non-emergency) diesel engines. Catalyzed DPFs can achieve an 85 percent reduction in diesel PM, and a 90 percent reduction in organic gases and carbon monoxide. Since adoption of the Risk Management Guidance, the local air pollution control districts have been implementing the recommendations, and to date, well over 50 stationary diesel engines have been placed in service with DPF controls.

The Risk Management Guidance was a first step in our efforts to address the toxic emissions from stationary diesel engines. To achieve further reductions from this source category, over the last two years, ARB staff has been developing a statewide ATCM that will reduce diesel exhaust emissions from both new and in-use stationary diesel engines. The proposed regulation requires catalyzed DPFs on all prime stationary diesel engines. We anticipate rulemaking action on this regulation in July 2003. More information on this effort and the current draft of this regulation is available at http://www.arb.ca.gov/diesel/documents.htm.

Our fundamental concern with the proposed RICE NESHAP is that it will create conflicting requirements in California for new diesel engines, unnecessarily increase costs to California businesses, and result in no emission reduction benefits. Briefly, our key issues associated with the proposal are as follows:

- The RICE NESHAP is not health protective because it only regulates organic gases and ignores diesel PM. A more health protective approach for addressing the risk from stationary diesel engines is to reduce emissions of diesel PM.
- The RICE NESHAP does not recognize diesel particulate filters (DPFs) as a significantly more effective control device for reducing diesel exhaust emissions compared to diesel oxidation catalysts (DOCs).
- The RICE NESHAP recordkeeping, reporting, monitoring, and testing requirements are not appropriate for diesel engines meeting a diesel PM emission standard.
- The definition of "reconstruction" should be modified to exclude the cost associated with complying with State and local emission standards.
- The RICE NESHAP requirements are not sufficient to meet the risk reduction goals of the Urban Air Toxic Strategy.

As mentioned previously, these are significant issues for California. To address our concerns, we recommend that a provision be added to the RICE NESHAP exempting diesel engines that comply with the ARB adopted Stationary Diesel Engine ATCM provided that ARB demonstrates that the applicable emission standards are at least as stringent those in the RICE NESHAP.

We believe this approach is consistent with the intent of 40 CFR, Title II, Section 209 which gives California the authority to establish new and in-use standard for nonroad engines. We also believe that providing an exemption in the RICE NESHAP is a more practical approach than seeking equivalency under the Section 112(l) process.

Thank you for this opportunity to comment on the RICE NESHAP. Should you have questions regarding these comments please contact me at (916) 322-6023.

Sincerely,

/s/

Daniel E. Donohoue, Chief
Emissions Assessment Branch
Stationary Source Division

Enclosure

cc: Jack Broadbent, EPA Region 9
Mary Sullivan Douglas, STAPPA/ALAPCO
Barbara Lee, CAPCOA
Stew Wilson, CAPCOA
Sally Shaver, EPA OAQPS ESD
Sims Roy EPA OAQPS ESD CG

**Air Resources Board Comments on the Proposed National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines**

## Recommendation

**To address the issues raised below, we recommend that the RICE NESHAP include a provision to exempt stationary diesel engines in California that meet the requirements of California's Stationary Diesel Engine Airborne Toxic Control Measure (ATCM).**

## Comments

1. **The RICE NESHAP should allow S/L to regulate diesel PM as a more health protective alternative for addressing the risk from diesel exhaust.**

    - In 1998, particulate matter for diesel-fueled engines (diesel PM) was recognized by the California Air Resources Board (ARB) as the toxic air contaminant (TAC) that best characterized the toxic risk from diesel exhaust. The California Office of Environmental Health Hazard Assessment recommended a cancer unit risk factor (URF) of 300 excess cancers per million per microgram per cubic meter of diesel PM. Quantitatively, diesel PM has a URF that is 50 times greater than formaldehyde.

    - All major health agencies agree that adverse human health effects results from environmental exposure to diesel exhaust. From a public health perspective, focusing on diesel PM as a surrogate for whole diesel exhaust is a more health protective approach compared to focusing on only organic gases and the soluble organic fraction as proposed in the RICE NESHAP.
        - The California Air Resources Board identified diesel PM as a toxic air contaminant in 1998 after 10 years of study and debate. (See references).
        - A consistent relationship between occupational diesel exhaust exposure and lung cancer was found in more than 30 human epidemiological studies (Diesel ID Doc, OEHHA 1998).
        - Over 95 percent of the particulate matter emitted from diesel engines is 2.5 microns or less in size. Reducing diesel PM will reduce PM mortality and other adverse health effects such as increases in asthma and bronchitis (Lloyd & Cackette, AWMA, June 2001).
        - If one calculates the potential cancer risk from a diesel engine meeting the proposed formaldehyde standard, an engine could operate 24 hours a day, 365 days a year, and result in a 70 year potential cancer risk of less than 0.1 in a million. However, the same engine could only operate about

eighty (80) hours per year before reaching a potential cancer risk of 0.1 in a million when ARB's diesel PM unit risk factor of 300 cancer/ug/$m^3$ is used.

2. **The RICE NESHAP should recognize diesel particulate filters (DPFs) as a significantly more effective control device for reducing diesel exhaust emission compared to diesel oxidation catalysts (DOCs).**

- Diesel oxidation catalysts (DOCs) are not as effective as diesel particulate filters (DPFs) in reducing diesel exhaust emissions and the associated health risk.
  - DOCs reduce mainly the organic gases and soluble organic fraction of diesel exhaust. Catalyzed DPFs reduce organic gases, soluble organic fraction, semi-volatile organic compounds, organic carbon particulate matter, and elemental carbon particulate matter.
  - DPFs reduce diesel PM over the entire particulate size range including ultrafine particulate matter. DOCs do not reduce ultrafine particulate matter.
  - DPFs have demonstrated 85 percent reduction in diesel PM and 90 percent reduction in formaldehyde and carbon monoxide. DOCs have demonstrated 20 to 30 percent reduction in diesel PM and 70 percent reduction in formaldehyde and carbon monoxide.

- The use of DOCs to reduce diesel exhaust emissions is not consistent with U.S. EPA's approach for reducing diesel emissions from on-road and off-road engines.
  - The 2007 on-road heavy-duty diesel engines will need to meet a 0.01 grams per brake horsepower hour (g/bhp-hr) standard for PM. Off-road diesel engines, greater than 500 hp, currently meet a 0.15 g/bhp-hr PM standard. We expect these standards to be reduced to 0.01 g/bhp-hr in the 2010 to 2012 time frame. Meeting these standards will require catalyzed DPF technology.
  - The majority of engines supplied to California for stationary applications currently are nonroad engines certified to meet ARB and EPA's nonroad engine certification standards.
  - At a minimum, all new stationary diesel engines should meet the nonroad engine certification standards.

3. **The recordkeeping, reporting, monitoring, and testing requirements in the RICE NESHAP are not appropriate for diesel engine meeting a diesel PM emission standard.**

- The recordkeeping, reporting, monitoring, and testing requirements in the RICE NEHSAP focus on formaldehyde and carbon monoxide. These provisions are not appropriate for emission standards based on diesel PM.

- The continuous emissions monitoring requirements in the proposed RICE NESHAP will more than double the compliance cost if these requirements must be met in addition to complying with the parameter monitoring requirements in the proposed Stationary Diesel Engine ATCM.

- The annual source-testing requirement in the proposed rule is not necessary, appropriate, or cost effective for engines equipped with a DPF control system.

4. **The definition of "reconstruction" should be modified to exclude the cost associated with complying with S/L emission standards.**

   - The "reconstruction" definition should be modified to exclude costs associated with adding control systems or making engine modifications required by state or local agencies. The proposed Stationary Diesel Engine ATCM requires in-use prime (non-emergency) diesel engines to reduce emissions by 85 percent or meet a PM standard of 0.01 g/bhp-hr. Meeting this standard will require the installation of catalyzed DPF control technology. Given that the current cost of a catalyzed DPF is about $40/bhp-hr, simply adding emission controls could exceed the reconstruction cost threshold. As a result, engines that normally would not be subject to the RICE NESHAP would become subject simply by taking actions to significantly reduce diesel engine emissions.

5. **The RICE MACT requirements are not sufficient to meet the risk reduction goals of Urban Air Toxic Strategy.**

   - The proposed RICE NESHAP would effect a limited number of engines and achieve an emission reduction from these engines of less than 30 percent, far below the goal of a 75 percent reduction in air toxics specified in the Integrated Urban Air Toxic Strategy.

## References

Executive Summary for The Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant
http://www.arb.ca.gov/regact/diesltac/diesltac.htm
http://www.arb.ca.gov/toxics/dieseltac/finexsum.pdf

California's Diesel Risk Reduction Program
http://www.arb.ca.gov/diesel/documents/rrpapp.htm

California's Diesel Risk Reduction Program, Stationary/Portable
http://www.arb.ca.gov/diesel/statport.htm

Risk Management Guideline for the Permitting of New Stationary Diesel-Fueled Engines
http://www.arb.ca.gov/diesel/documents/rmg.htm

Draft ATCM for New Stationary Diesel Fueled Engines
http://www.arb.ca.gov/diesel/documents/111902draftatcm-new.pdf

Draft ATCM for In-Use Diesel Fueled Engines
http://www.arb.ca.gov/diesel/documents/111902draftatcm-inuse.pdf

Diesel Engines: Environmental Impact and Control, Alan C. Lloyd & Thomas A. Cackette, California Air Resources Board, published in the Journal of the Air & Waste Management Association, Volume 51, June 2001.
http://www.arb.ca.gov/research/seminars/lloyd/AWMA2001/AWMA2001.htm

# Appendix K

## List of Acronyms and Abbreviations

# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AB | Assembly bill |
| ARB, or the Board | Air Resources Board |
| APCO | Air Pollution Control Officer |
| ATCM | Airborne Toxic Control Measure |
| B100 | 100% biodiesel |
| B50 | 50% biodiesel / 50% diesel fuel |
| BACT | Best available control technology |
| Bhp | Brake horsepower |
| $^{\circ}C$ | Degrees Celsius |
| CAPCOA | California Air Pollution Control Officers Association |
| CARB | California Air Resource Board |
| CCAA | California Clean Air Act |
| CCR | California Code of Regulations |
| CHAPIS | Community Health Air Pollution Information System |
| CEQA | California Environmental Quality Act |
| CI | Compression ignition |
| CNG | Compressed natural gas |
| CCEEB | Council for Economic and Environmental Balance |
| CRT | Continuously Regenerating Trap |
| DDC | Detroit Diesel Corporation |
| DECS | Diesel Emission Control System or Strategy |
| DG | Distributed Generation |
| DOC | Diesel Oxidation Catalyst |
| DOF | Department of Finance |
| $/lb | Dollars per pound |
| DPF | Diesel particulate filter |
| Diesel PM | Diesel Particulate Matter |
| DRRP, or Diesel Risk Reduction Plan | Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles Risk Reduction Plan |
| DHS | Department of Health Services |
| DTSC | Department of Toxic Substances Control |
| EO | Executive Officer of the Air Resource Board |
| EQIP | Environmental Quality Incentives Program |
| ES Survey | Emergency Stand-by diesel fueled engine survey |
| $^{\circ}F$ | Degrees Fahrenheit |
| FM | Factory Mutual |
| FTF | Flow-through filter |
| g/bhp-hr | Grams per brakehorsepower-hour |
| HSC Sections 39600 | General Powers |
| EMD | General Motors Electro-Motive Division |
| $>$ | Greater than |

| | |
|---|---|
| HC | Hydrocarbon |
| HRA | Health Risk Assessment |
| H&SC | California Health and Safety Code |
| ISC | Interruptible Service Contract |
| ISO | International Standards Organization |
| ISOR | Initial Statement of Reasons |
| $\leq$ | Less than or equal to |
| LAER | Lowest Achievable Emission Rate |
| LPG | Liquefied petroleum gas |
| Low sulfur diesel fuel | Diesel fuel with less than 15 ppmw sulfur content |
| $\mu g/m^3$ | Microgram per cubic meter |
| NAAQS | National Ambient Air Quality Standard |
| NASA | National Aeronautical Space Administration |
| NESHAP | National Emission Standard for Hazardous Air Pollutants |
| NMHC | Non-methane hydrocarbons |
| NFPA | National Fire Protection Association |
| NO | Nitrogen oxide |
| $NO_2$ | Nitrogen dioxide |
| $NO_x$ | Oxides of nitrogen |
| NRCS | National Resources Conservation Service |
| NSPS | New Source Performance Standard |
| NSR | New Source Review |
| OCS | Outer Continental Shelf |
| OEHHA | Office of Environmental Health Hazard Assessment |
| O & M | Operation and maintenance |
| OSHPD | Office of Statewide Health and Planning Department |
| PAH | Polycyclic Aromatic Hydrocarbons |
| PGM | Platinum group metals |
| PM | Particulate matter |
| $PM_{10}$ | Particulate Matter range 10 microns or less in diameter |
| $PM_{2.5}$ | Particulate Matter range less then 2.5 microns in diameter |
| ppmvd | Parts per million, volume dry |
| PTSD | Planning and Technical Support Division of ARB |
| POTW | Publicly-owned Treatment Works |
| Prime Survey | Stationary Diesel fueled Prime Engine Survey |
| PSD | Prevention of Significant Deterioration |
| ROE | Return on Owner's Equity |
| ROG | Reactive Organic Gases |
| SCR | Selective Catalytic Reduction |
| SIC | Standard Industrial Classification |
| SIP | State Implementation Program |
| SRP | Scientific Review Panel |
| SCAQMD | South Coast Air Quality Management District |
| SDCAPCD | San Diego County Air Pollution Control District |

| | |
|---|---|
| SJVAPCD | San Joaquin Air Pollution Control District |
| SMAPCD | Sacramento Metropolitan Air Quality District |
| SSD | Stationary Source Division of ARB |
| SFM | Office of the State Fire Marshals office |
| SOF | Soluble Organic Fraction |
| SOx | Sulfur Oxides |
| TAC | Toxic air contaminant |
| T-BACT | Toxic Best Available Control Technology |
| THC | Total Hydrocarbons |
| tpd | Tons per day |
| UL | Underwriters Lab |
| U. S. EPA | United States Environmental Protection Agency |

**State of California**
**AIR RESOURCES BOARD**

NOTICE OF PUBLIC MEETING TO CONSIDER A DRAFT REPORT:
PLANNED AIR POLLUTION RESEARCH, FISCAL YEAR 2003-2004

The California Air Resources Board (ARB or Board) will conduct a public meeting at the time and place noted below to consider a draft report, titled *"Planned Air Pollution Research, Fiscal Year 2003-2004."* The Board will meet concurrently with the Research Screening Committee (RSC).

DATE: November 20, 2003

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Central Valley Auditorium, Second Floor
1001 I Street
Sacramento, CA 95814

The item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., November 20, 2003, and may continue at 8:30 a.m., November 21, 2003. Please note that this item may not be considered until November 21, 2003. Please consult the agenda for the meeting, which will be available at least 10 days before November 20, 2003 to determine the day on which this item will be considered.

If you have special accommodation, language needs or are a person with a disability and desire to obtain this document in an alternative format, please contact ARB's Clerk of the Board at (916) 322-5594 or sdorais@arb.ca.gov as soon as possible. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

## OVERVIEW

The California Health and Safety Code (HSC), Sections 39700 and 39703, declares that an effective research program is an integral part of California's broad-based, statewide effort to combat air pollution. It also directs the Board to coordinate and administer all air pollution research that is funded, to any extent, with state funds. To facilitate this process, HSC Section 39705 directs the Board to appoint a screening committee to give advice and recommendations on all air pollution research projects proposed for funding.

The draft report is comprised of research ideas for the current fiscal year. The general public, business and academic communities, and ARB staff submitted the ideas. The research ideas were provided to the RSC for review and comment on August 18, 2003. The RSC met on October 3, 2003 to review the final list of projects.

Consistent with long-established policy, the Board meets annually with the RSC to review and discuss ongoing projects and research proposed for the next fiscal year. At the November 20, 2003 meeting, the RSC and ARB staff will present their report, "*Planned Air Pollution Research, Fiscal Year 2003-2004,*" to the Board for approval. The report describes projected funding allocations and proposed research projects; some recommended for funding and others recommended if funding becomes available.

**AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS**

Copies of the report, *Planned Air Pollution Research Fiscal Year 2003-2004*, will be available for inspection at the Board's Public Information Office, Air Resources Board, Visitors and Environmental Services Center, 1001 I Street, 1st Floor, Sacramento, California 95814, (916) 322-2990, at least 10 days prior to the scheduled meeting.

Inquiries concerning the draft report may be directed to the designated agency contact person, Annmarie Mora, Air Pollution Specialist, at (916) 323-1517 or by email at amora@arb.ca.gov.

This notice and the draft report, when completed, will be available on the ARB's website at http://www.arb.ca.gov/research/apr/apr.htm.

**SUBMITTAL OF COMMENTS**

The public may present comments relating to this matter orally or in writing at the hearing, and in writing or by email before the hearing. To be considered by the Board, written submissions must be received **no later than 12:00 noon, November 19, 2003**, and addressed to the following:

Clerk of the Board
Air Resources Board
1001 I Street, 23rd floor
Sacramento, CA 95814

Electronic mail is sent to: rdfy0304@listserv.arb.ca.gov, and received at the ARB **no later than 12:00 noon, November 19, 2003.**

Facsimile submissions are to be transmitted to the Clerk of the Board at (916) 322-3928 and received at the ARB **no later than 12:00 noon, November 19, 2003**.

The Board requests but does not require 30 copies of any written submission. Also, the ARB requests that written and e-mail statements be filed at least 10 days prior to the meeting so that ARB staff and Board Members have time to fully consider each comment. The ARB encourages members of the public to bring any suggestions or comments to the attention of staff in advance of the meeting.

CALIFORNIA AIR RESOURCES BOARD

Catherine Witherspoon
Executive Officer

Date:

California Environmental Protection Agency

Air Resources Board

# PLANNED AIR POLLUTION RESEARCH

## Fiscal Year 2003-2004

Draft: 10-31-03

November 2003

## Acknowledgments

This report was prepared with the assistance and support of managers and staff from the Research Division, Mobile Source Control Division, Planning and Technical Support Division, and Stationary Source Division of the Air Resources Board. We would also like to acknowledge the members of the academic community, government agencies, private businesses, and the public who submitted research ideas.



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**Reviewed By:**

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Lynn Terry, Deputy Executive Officer
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**CALIFORNIA AIR RESOURCES BOARD**

# PLANNED AIR POLLUTION RESEARCH FISCAL YEAR 2003-2004

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**Technology Advancement and Pollution Prevention**

**Recommended**

**Recommended if Funding Available**



**Global Air Pollution**

**Recommended**

## Summary

This report presents the Air Resources Board's planned air pollution research for the fiscal year 2003-2004. Nineteen projects are proposed. Seventeen are recommended for funding and two are recommended if funding is available. This research portfolio is organized into four main areas of research – Health and Welfare Effects, Exposure Assessment, Technology Advancement and Pollution Prevention, and Global Air Pollution. This annual plan proposes research in these four areas, with a primary emphasis on particulate matter health effects, and exposure assessment and control of particulate matter. The proposed budget for the recommended projects is $5,500,000.

# Introduction

The Air Resources Board (ARB) sponsors a comprehensive program of research addressing the causes, effects, and possible solutions to air pollution problems in California, and provides support for establishing ambient air quality standards. The Board's research program was established by the Legislature in 1971 (Health and Safety Code Sections 39700 et seq.) to develop a better understanding of the various aspects of air pollution, including air pollution's effects on health and the environment, the atmospheric reactions and transport of pollutants, and the inventory and control of air polluting emissions. In recent years, several legislative mandates have expanded and further defined the scope of the program.

The ARB's mission to protect California's public health, welfare, and ecological resources are supported through a Strategic Plan for Research covering the years 2001-2010. The Strategic Plan is based on the ARB's regulatory priorities for the next decade and provides direction for the ARB's research program. The four main areas of research identified in the Strategic Plan are - Health and Welfare Effects, Exposure Assessment, Technology Advancement and Pollution Prevention, and Global Air Pollution. They are also the categories that guide this plan. These areas encompass the comprehensive mission of ARB's air pollution research. A copy of the Strategic Plan can be found at http://www.arb.ca.gov/research/apr/apr.htm.

The proposed research projects are not intended to be exhaustive or exclusive. Unanticipated opportunities, unique or innovative study approaches, or urgency may lead to consideration of other projects.

***Objective of the Research Program.*** The goal of the research program is to provide the timely scientific and technical information that will allow the Board and local districts to make the public policy decisions necessary to implement an effective air pollution control program in California. The relevant problems addressed in these policy decisions are identified by the Legislature, the Board, a Board research advisory committee, ARB staff, local air pollution control districts, the academic community, and the public.

***Planning the Research Program.*** The Board sends out a public solicitation inviting and encouraging the public to contribute ideas for project consideration. Members of the public, the academic community and ARB staff, submit research ideas. To aid in the evaluation, the Board's Executive Officer established internal committees to review research ideas. Proposed projects were examined for relevance to regulatory questions facing the Board and modified as necessary. Committee members then prioritized candidate projects in order of urgency and importance. The Research Screening Committee (RSC) reviewed these candidate projects and their priorities. The list of projects, along with comments from the RSC, were forwarded to the Executive Research Review Committee, whose members are the Executive Officer, her three deputies, and the Chief of the Research Division. The Executive Research Review Committee reviewed all of the proposed projects and established project priorities. Selected projects are then placed into two categories: 1) those that are recommended for funding, and 2) those that are recommended if funding is available. The Research Screening Committee reviewed the selected projects and recommended the Plan to the Board.
**Implementation of the Plan.** The next step for projects approved in the plan will be their development into full research projects. The submission and selection of an idea does not guarantee a resulting contract for the submitter. Rather, the ARB is required to first look at

public California universities for expertise to execute these projects. If the universities do not possess the expertise, then a public solicitation is issued or a sole source contract is awarded. There is a list serve that individuals can subscribe to for receiving updates on research activities. More information on the list serve can be found at http://www.arb.ca.gov/listserv/research/research.htm.

**Research Budget.** The 17 recommended projects total $5,500,000. The allocations for the proposed recommended projects among research categories are as follows:

| RESEARCH CATEGORY | BUDGET |
|---|---|
| Health and Welfare Effects | $1,370,000 |
| Exposure Assessment | $3,080,000* |
| Technology Advancement and Pollution Prevention | $ 600,000 |
| Global Air Pollution | $ 450,000 |

***$2.5 million from the California Energy Commission***

**Project Cosponsoships.** The Research Division is continually looking for cofunding opportunities and other ways to leverage the state's research dollars. This effort allows the ARB to be part of projects and studies that may otherwise be out of the state's fiscal reach. ARB has had great success in working with other research organizations and has been part of multimillion dollar studies with nominal cash contributions. Several of the projects in this plan have either confirmed or have potential cofunding dollars included in the cost category.

**Summaries of Past Research.** Ongoing research projects and projects completed since the beginning of 1989 are summarized in the Research Division's publication, Air Pollution Research, which is available on the World Wide Web at http://www.arb.ca.gov/research/apr/past/past.htm. For a printed copy of this publication, please contact:

Annmarie Mora
California Air Resources Board
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P.O. Box 2815
Sacramento, California 95812
Phone: (916) 323-1517
FAX: (916) 322-4357
email: amora@arb.ca.gov

Electronic copies of all of the Research Division's final reports are available for downloading at the same web site.

# RESEARCH PROJECT DESCRIPTIONS

One-page summaries of all the research projects for which funding is recommended (or recommended if funding is available) are provided in this section.

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**TITLE: Investigation of the Relation of Traffic and Ultrafine Particles to Mortality in California**

**PROBLEM:** Although there are few studies relating adverse health effects to traffic-based pollution, several epidemiological studies suggest that residence near areas of high traffic density may be associated with respiratory symptoms in children, decrements in lung function, cancer, premature birth and mortality. Most studies, however, have relied on crude measures of traffic exposure; few have utilized measurements of localized pollutant concentrations, especially ultrafine particles (UFP or particles less than 0.1 micron). UFP are generated by both gasoline- and diesel-fueled vehicles and are of considerable research interest because of their demonstrated toxicological potential to induce oxidative stress and cause cellular damage. Given the dearth of studies on traffic-specific effects, it is important to undertake new studies examining their health impacts.

**PREVIOUS WORK:** A few time-series studies have reported associations between ambient PM2.5 and mortality. Several studies have linked UFP to inflammation, asthma exacerbation and other adverse health outcomes. A recent time-series study in Holland indicated that individuals who lived adjacent to a major highway had an increased risk of death associated with exposure to PM10 and Black Smoke. However, the pollution mix, activity patterns and exposures are likely to be quite different in California.

**OBJECTIVE:** The objective is to conduct an epidemiologic study of the relationship between daily mortality and alternative measures of traffic, including: (1) an exploratory analysis for the years 2001 and 2002 using the ARB's UFP monitoring at the Children's Health Study monitoring stations in southern California; and (2) an analysis of PM2.5-mortality relationships for the years 1999 through 2002 incorporating traffic metrics developed from geographical information system (GIS) software.

**DESCRIPTION:** This project will focus on the mortality impacts of residential proximity to traffic, based on both GIS-derived measures of traffic and some limited measurement of UFP. We propose to use spatial analysis, meteorological data, and census data to select the population (based on census tracts and block groups) likely to be represented by a given UFP monitor. We will then link these data with existing mortality data and emergency room data from local hospitals. Specifically, we will test whether a stronger association between PM2.5 and mortality exists for those living in census tracts, block groups or zip codes within a given distance (e.g., less than 150 meters from a major roadway). Such a study is now possible due to the existence of: (1) daily PM2.5 data for eight major counties in California for 1999 through 2002, and (2) concurrent mortality data with attributed addresses. Both sets of data have been made available to us for this project.

**BENEFITS:** This project would represent an important contribution to our understanding of the health impacts of traffic and UFP and will provide methodological insight to inform the design of future epidemiological studies. In addition, successful completion of this project may shed some light on issues of environmental justice, given that low-income and minority groups often live closer to major roadways than much of the population.

**COST:** $220,000

**TITLE: Cardiovascular Disease and Asthma and Exposure to Long-term Air Pollution in the California Teachers Study Cohort.**

**PROBLEM:** Short-term ambient air pollution exposure has been implicated as a risk factor for exacerbation of pre-existing illness and for mortality in susceptible individuals. In contrast, much less is known about: (1) the health impacts of longer-term exposure, particularly on the development of cardiac or respiratory diseases; and (2) the roles of specific sources, especially traffic-associated emissions, with respect to the pathogenesis of chronic illness.

**PREVIOUS WORK:** California Department of Health Services (CDHS) staff members have collaborated with university researchers and the Northern California Cancer Center to establish the California Teachers' Study (CTS), a prospective study of 133,479 current and former female public school teachers and administrators recruited in 1995 from the California State Teachers Retirement System (mean age = 54 years in 1995). Follow-up data on disease incidence and mortality are currently available from 1995 through 2002. CDHS staff members have also developed several traffic exposure metrics using Geographic Information Systems that are considered state-of-the-art.

**OBJECTIVE:** To determine if long-term exposures to PM or to any of several gaseous pollutants are related to cardiovascular disease incidence or mortality and/or is exposure to traffic emissions, measured by residential proximity to busy roads, related to cardiovascular disease incidence or mortality. This project will also examine pollutant and traffic relationships with other health outcomes, including lung cancer and other respiratory diseases, as well as total mortality.

**DESCRIPTION:** Three series of detailed mailed questionnaires and computer linkages with California mortality and hospitalization databases will allow for examination of the incidence of mortality from diseases. Addresses of all participants have been geo-coded which will permit a more refined analysis of exposure to air pollution, especially to traffic exposures. Similarly, because prevalence of active smoking in this cohort is low (<5%) and occupational exposures to respiratory irritants almost nonexistent, the database will allow for careful investigation of impacts of air pollution. This analysis would focus on the subset of study participants who live within 20 miles of fixed-site monitors. Multi-year averages of PM10, ozone, nitrogen dioxide, carbon monoxide, and several air toxics will be developed. The investigators will also utilize several years of PM2.5 monitoring and reconstruct additional fine particle data from airport visibility measurement. The primary analysis would also examine several traffic metrics, as well as long-term pollutant averages, as predictors of the health outcomes, using Cox proportionate hazards regression. Controls will include a variety of potential confounders and effect modifiers, including exposure to active and passive cigarette smoke, alcohol consumption, body mass index, and history of hypertension, dietary factors, and exercise.

**BENEFITS:** This effort would involve analysis of existing datasets and would leverage the infrastructure of an enormous ongoing study. The results would be the first to examine impacts of long-term traffic exposures on incidence and mortality from cardiovascular disease in the U.S., and would also be the first large cohort anywhere to examine the relationship of long-term air pollution exposure on the incidence of new cases of cardiovascular diseases.

**COST:** $220,000

**TITLE: Time-series Study of Mortality/Morbidity from Ambient Woodsmoke.**

**PROBLEM:** The fact that urban particulate matter (PM) increases mortality and morbidity has been documented in many U.S. cities, but in most cases traffic exhaust or industrial air pollution were the dominant emission sources. Wood burning emits PM, carbon monoxide (CO), and a variety of organic compounds, however, there is little direct evidence about the quantitative health impacts of ambient woodsmoke itself.

**PREVIOUS WORK:** Christchurch, New Zealand, has one of the largest city populations (300,000) in developed countries exposed to high woodsmoke levels. Research by the New Zealand Environmental and Occupational Health Research Center shows woodsmoke makes up 80 – 90% of ambient PM during winter months with PM2.5/PM10 ratio ≈ 0.90. The 24-hour PM10 levels exceed 50 $\mu g/m^3$ about 30 days each winter, while peak levels are above 200.

**OBJECTIVE:** To quantify relationships between woodsmoke exposure variables and daily morbidity/mortality over a 12-year period for which data are available.

**DESCRIPTION:** Hourly air pollution monitoring (PM10, CO, NO, $NO_2$, NOx, $SO_2$) and meteorological data from a central monitoring site for the years 1988-2000 will be acquired from the regional environmental office. Data from other monitoring sites and emission inventories (already available) will be used to validate the geographic distribution. Multiple regression analyses will be used to identify the conditions in which high woodsmoke air pollution occurs. Indoor/outdoor air pollution levels (PM2.5, PM10, CO) will be measured and questionnaires administered at 40 non-smoking pensioner (age 65-75 years) households located closely to a fixed monitoring site during winter and summer. These results and the fixed outdoor measurements will be compared in order to assess the best estimate of personal exposure (for elderly people) to woodsmoke. The Poisson regression protocol, by Air Pollution and Health: A European Approach, will be used taking into account recent updates of this protocol to determine risk levels. Mortality (all causes) and hospital admission (respiratory and heart disease) data for all population groups in Christchurch for the period 1988 to 1999 will be acquired from the New Zealand Health Information Service. Daily data including age, sex, address (census area), ethnicity and 4-digit ICD-9 code will be used.

The data from this study and previously published reports will be used to prepare a review report on all aspects of human exposure from woodsmoke due to the heating of houses. Chemical composition, particle size distributions, air concentrations, and the influence of climatic conditions will be discussed. Relationship between outdoor levels and indoor levels will be analyzed and compared to those in California.

Epidemiological analyses will be done in direct collaboration with the California Office of Environmental Health Hazard Assessment.

**BENEFITS:** Residential woodsmoke is responsible for a substantial fraction of ambient PM in many California communities, mostly in winter. The Christchurch dataset offers a unique opportunity to evaluate the risk of nearly pure woodsmoke within a culturally and economically similar population sufficiently large and with the high-quality medical and pollution monitoring needed to produce statistically valid results. No such community is available in California.

**COST:** $115,000

**TITLE: Effect of Genetic Variants on Ozone-Induced Allergic Airway Inflammation in Asthmatics**

**PROBLEM:** Ambient ozone levels have been associated with asthma exacerbations in several epidemiological studies, although the mechanism is not known. One possible mechanism is enhancement of allergen-induced airway inflammation.

**PREVIOUS WORK:** Controlled human exposure studies that have addressed the effect of ozone on subsequent pulmonary function responses to allergen have not consistently found ozone-induced enhancement of bronchoconstriction. This raises the question as to whether the timing of $O_3$ challenge relative to allergen challenge is a significant factor in explaining the discrepancies in the literature, or alternatively, whether there is more than one sub-population of asthmatics, each with a different response profile. One mechanism by which ozone induces adverse effects is through activation of oxidative stress pathways. The GSTM1 gene regulates a key antioxidant enzyme that is involved in protection from and repair of damage from oxidative stress reactions in the lungs. Several studies also suggest that a common genetic variant that results in the absence of a key antioxidant enzyme, GSTM1, may play a key role in the toxicity of inhaled ozone, and may be a basis for differences between individuals in susceptibility to adverse effects from ozone inhalation.

**OBJECTIVES** 1) to determine whether ozone enhances specific allergic airway inflammatory responses in asthmatics by using the technique of local endobronchial allergen challenge; 2) to assess the effect of the GSTM1 null genotype on ozone enhancement of allergic airway inflammation; and 3) to assess whether exposure to ozone at the current federal ambient air quality standard (0.08 ppm for 8 hrs) can enhance allergic airway inflammation. 3) to investigate whether the exposure sequence ($O_3$ – allergen vs. allergen – $O_3$) explains between subject inconsistencies in the responses to combined $O_3$/allergen exposures.

**DESCRIPTION:** Human subjects with asthma who are specifically sensitized to house dust mite will be studied. Screening of potential subjects will be done to ensure that at least 50% of the subjects have the GSTM1 null genotype. Subjects will participate in three exposures, including one to filtered air (FA), and two to 0.16 ppm ozone. They will undergo local endobronchial allergen challenge 18 hrs following the FA and one of the $O_3$ exposures, with sampling bronchoscopy 6 hours later. Local endobronchial allergen challenge will occur the day before the second $O_3$ exposure, with the sampling bronchoscopy following the $O_3$ exposure. All exposures will involve intermittent exercise. Various cellular and biochemical indices of airway inflammation will be assayed in the bronchoscopically obtained samples. Subjects will also be genotyped for several other genes that may be related to susceptibility to adverse effects of $O_3$ exposure (GSTT1, GSTP1, NQO1, SOD2, GPX1, and catalase). The distribution of variants of these genes in the population is unknown, and consequently these will be exploratory analyses. However, the results from these exploratory analyses will help guide development of future investigations into the biological foundations of susceptibility to $O_3$ exposure.

**BENEFITS:** Greater understanding of how ozone might be causing exacerbations of asthma will accrue from this study. In addition, the safety of the current federal standard will be directly studied in a vulnerable population using a relevant outcome (allergic airway inflammation).

**COST:** $500,000

**TITLE: Traffic Pollution and Children's Health: Refining Estimates of Exposure for the East Bay Children's Respiratory Health Study.**

**PROBLEM:** Although epidemiological studies have documented associations between air pollutants and a variety of adverse health outcomes, the impact of exposure to traffic-based pollutants has not been well characterized. Most studies have used pollutant concentrations measured at central monitoring sites and therefore could not examine the impact of residential proximity to major roads. In this light, the Office of Environmental Health Hazard Assessment (OEHHA) is proposing to develop new measures of exposure to traffic and to conduct additional analyses of a dataset developed specifically to examine the influence of tra ffic on children's respiratory health outcomes.

**PREVIOUS WORK:** OEHHA recently conducted a school-based, epidemiological study to examine respiratory health among children living and attending schools at varying distances from high-traffic roads in Alameda County, CA. OEHHA found that traffic pollutants measured at neighborhood schools were elevated near major roads and were associated with both bronchitis and episodes of asthma.

**OBJECTIVE:** The objective is to refine estimates of exposure to traffic-related pollutants in the OEHHA study through the integration of traffic, air pollution and time-activity data, using geographic information (GIS) methods.

**DESCRIPTION:** In a previous study, OEHHA related traffic-based air pollution monitored at schools to bronchitis and asthma episodes in children. School pollutant concentrations were used as surrogates for children's overall exposure to traffic emissions. The proponent will refine these measures to better reflect exposures at both residences and schools. By reducing exposure measurement error, they will obtain a better quantitative assessment of the health impacts of traffic on a vulnerable population. The study population is 85% non-white and generally of lower socioeconomic status, making this study a good opportunity to examine the effects of traffic on a low income and primarily non-white population. For this project, there is good coverage from CalTrans traffic data and only a few major highways, making it easier to model traffic exposures. Ultimately, these factors make it easier to isolate the effect of traffic on respiratory health, particularly among a sub-population where the issue of environmental justice is relevant.

**BENEFITS:** Results will be used to determine the relation of traffic exposure to health outcomes among a vulnerable population of children. It will evaluate the relative importance of different approaches to refining exposure estimates and will provide methodological guidance for future traffic studies. Finally, it will address issues of environmental justice for subpopulations who are often highly exposed to traffic, but whose pollutant exposures are not routinely monitored.

**COST:** $284,000

**TITLE: The Use of Multi-Isotope Ratio Measurements as a New and Unique Mechanism to Resolve the Sources of Nitrate to Lake Tahoe.**

**PROBLEM:** The world-famous clarity of Lake Tahoe declined over 30% since the mid-1960s. The cause is directly related to elevating levels of nitrate. One of the most important unresolved issues is identifying the source of nitrate to the Lake. Agricultural and soil run off, groundwater, and transport and injection to the Lake by aerosols and wet deposition are potential culprits.

**PREVIOUS WORK:** The UCSD laboratory recently developed techniques to measure all isotopes of oxygen and nitrogen in aerosol and aqueous nitrate. These isotope signals have been instrumental in resolving a variety of long-standing issues. For example, measurement of Chilean nitrate deposits has shown quite clearly that they arise from atmospheric long-range transport. Aerosol and soil nitrate samples from the Antarctic have also furthered understanding of the source and transport of nitrate. From aerosol nitrate measurements of samples obtained in central California, it was uniquely shown that there are two distinct nitrate sources, one from *in situ* atmospheric oxidation and a second from entrainment of soil nitrate, in particular fertilizer. It has been shown from the central California aerosol measurements, that not only does the technique allow for resolution of the sources, it also allows for quantification of the individual sources.

**OBJECTIVE:** The objective is to quantify the sources of nitrate in Lake Tahoe, separating atmospheric and water sources.

**DESCRIPTION:** This project will perform nitrate isotope measurements on both aerosol and Lake water nitrates to identify and quantify the sources and variability of nitrate in the region and to the Lake. Measurements of rain and snow samples can also quantify their potential role in the region for the delivery of nitrates. This new technique has been demonstrated already to be unique in its ability to provide this information and would be a powerful complement to other measurement techniques done at the same time and place.

**BENEFITS:** The ARB is working with the Lahonton Regional Water Quality Control Board and the Tahoe Regional Planning Agency to develop atmospheric deposition estimates of nitrate and other pollutants to Lake Tahoe. These proposed measurements provide a unique, relatively low-cost opportunity to verify estimates of nitrate from both atmospheric and water sources, resolving potential conflicts in the attribution of water clarity loss.

**COST:** $75,000 (potential funding by U.S. EPA. This project will support work already sponsored by other research organizations in the Lake Tahoe Basin to develop a Total Maximum Daily Load (TMDL) for Lake Tahoe.

**TITLE: Health Impacts of Ultrafine Particulate Matter and Associated Air Pollutants in Elderly People with Heart Disease—Mechanistic Studies and Exposure Assessment**

**PROBLEM**: The elderly, especially those with cardiovascular disease, have been identified as especially vulnerable to the effects of air pollution. A major study is about to begin in southern California to study the impacts of air pollution on this group . The three-year study is funded by the National Institute of Environmental Health Sciences (NIEHS) at a cost of $3.3 million. PM air pollution, in particular the ultrafine size fraction, is of special interest. The study has limited air monitoring and does not include health-related assays that could provide mechanistic linkages between health outcomes and PM.

**PREVIOUS WORK**: Cardiovascular health impacts of ambient air pollution have been observed in several epidemiological studies. These studies find that PM, or some component, may cause changes in blood, in cardiac function, and may be associated with mortality in people with cardiovascular disease. Controlled animal and human exposure studies have been conducted which suggest mechanistic explanations for these findings. Recent studies suggest that the ultrafine fraction (diameter less than 0.1μm) may have a special potential for harm.

**OBJECTIVE**: This study would provide comprehensive, time-resolved air monitoring data for use in epidemiological analyses. It would also provide information on biological markers of effects that are related to possible mechanisms of cardiac injury.

**DESCRIPTION**: The NIEHS-funded health study will collect health outcome data from elderly people who reside at sheltered living facilities in southern California. The study will use data from existing routine air monitoring stations, personal and indoor monitoring, as well as ultrafine PM counts and activity records as exposure predictors.

The current proposal would provide funds and monitoring resources to expand the nature of air pollution data as well as to add collection and evaluation of the chemical and biological characteristics of PM samples. A mobile monitoring trailer, provided by ARB, would report ultrafine particle counts, NOx, CO, ozone, PM mass, carbon, nitrate, and sulfate. Indoor air monitoring efforts would also be enhanced. Mechanistic studies related to reactive oxygen species (ROS) are included. The ROS assays reflect cellular level toxicity of particles that may explain how PM can harm people.

**BENEFITS**: This study would address important questions of which chemical or size fractions of PM are most harmful, and what biological mechanisms underlie harmful effects. The funds requested would be heavily leveraged against a federally sponsored study with approximately $1/10^{th}$ of the total from ARB. The findings of this study would have direct application to our Vulnerable Populations Research Program, to evaluations of air quality standards for PM, and increase our level of understanding regarding important air pollution exposures experienced by the elderly, a group of special concern for adverse impacts from ambient PM. The nature of the overall study, with the proposed additional monitoring, may provide findings regarding the short-term health consequences of PM exposure.

**COST**: $175,000 ARB (plus equipment/support), $750,000 SCAQMD, $3.3 million NIEHS

**TITLE: Hourly, In-situ Quantitation of Organic Aerosol Marker Compounds.**

**PROBLEM:** Regulatory efforts to conform to PM2.5 standards require improvements in our knowledge of the factors controlling the concentration, size and chemical composition of PM2.5. While many advances have been made in measuring and modeling the inorganic ionic species that are found in PM2.5, much less is known about the organic fraction. Yet organic matter is a major constituent of airborne particles, comprising 20-40% of the PM2.5 mass in many regions. Quantitative, time-resolved knowledge of composition of PM2.5 organic matter is key to tracing its sources and understanding its formation and transformation processes.

**PREVIOUS WORK:** Generally, the most complete identification has been by gas chromatography followed by mass spectrometry (GC/MS). These methods have provided valuable insight and guidance in our understanding of airborne organic matter. While the identified compounds comprise only a fraction of the total organic mass, those that are quantified serve as valuable tracers for sources, and have been used to determine the relative contribution of various source types to primary ambient organic matter. However, analyses are costly, and generally the time resolution is poor. Needed is routine, time-resolved quantification of these organic marker compounds.

**OBJECTIVE:** To identify the origins of PM2.5 organic matter within a region in California that is currently out of compliance with PM air quality standards utilizing hourly, in-situ measurements of organic marker compounds.

**DESCRIPTION:** Currently a field-portable, semi-continuous instrument for the quantitative, time-resolved measurement of the ambient concentration of specific organic compounds in PM2.5 is being developed and will be tested in a field study next summer. The collection and analysis steps will be automated, yielding around the clock speciation with hourly time resolution. Following successful completion of the field study, the instrument will be deployed for one winter month and one summer month at a site in California. This instrument will measure the chemical signatures for important organic aerosol sources such as, biomass burning, to identify marker compounds that should be measurable in ambient air samples. The field measurements in the Central Valley will provide comprehensive data sets suitable for interpreting diurnal patterns, and determining sources of organic species.

**BENEFITS:** This work addresses the critical need for on-line, time-resolved, quantitative measurement of atmospheric PM2.5 organics at the molecular level. Marker compounds unique to specific source types provide a means of determining the relative contribution of primary sources. Data at the compound level are also needed for understanding the chemical formation and transformation mechanisms leading to secondary organic aerosol formation. This research will provide useful new data of immediate value for air quality attainment strategies for the Central Valley and the development of the State Implementation Plan. The placement of an enhanced air monitoring site in Fresno provides a unique opportunity for complementary research.

**COST:** $260,000

**TITLE: Polycyclic Aromatic Hydrocarbons (PAH) Sources of Ambient Quinones.**

**PROBLEM:** It has been hypothesized that much of the high morbidity and mortality associated with fine particulate matter (PM) is due to quinones and their reduction products, adsorbed to the particulate core (e.g., "Role of Quinones in Toxicology", J. Bolton et al., *Chem. Res. Toxicol.*, 13, p. 135-160, 2000; J. Froines, ARB Chairman's seminar, June 18, 2003). Although quinones are toxic through their direct reaction with DNA, they also enter into oxidation-reduction (redox) reactions. Through redox reactions, one equivalent of quinone can generate multiple equivalents of toxic 'reactive oxygen species', and thereby overwhelm the protective effects of cellular enzymes and reducing agents. PAH-quinones, which are formed from atmospheric reactions of semi-volatile PAHs present in diesel and gasoline vehicle exhaust, may have potentially significant consequences for the health of California's residents. It is therefore important to understand the extent of PAH-quinone formation in ambient air.

**PREVIOUS WORK:** Dimethyl-naphthalenes (DMNs), along with naphthalene and methyl-naphthalenes, are generally the most abundant PAHs in ambient air, and are largely derived from volatilized diesel fuel. We have shown that DMNs react rapidly in the air (via both OH radical- and nitrate radical-initiated reactions) to form dimethyl-nitro-naphthalenes (nitro-DMNs). Nitro-DMNs have been found in ambient air, but our results suggest that they photolyze rapidly. Moreover, we have shown that nitro-naphthalenes photolyze to yield significant amounts of naphtho-quinones. Therefore, the photolysis of nitro-PAHs (such as nitro-DMNs) may be an important source of ambient PAH-quinones. Once formed, PAH-quinones are likely to be quite stable in the ambient air, certainly compared to their PAH precursors.

**OBJECTIVES:** Identify the nitro-DMNs formed from atmospheric reactions of selected dimethyl-naphthalenes and study their photolysis reactions and products, which are expected to include quinones.

**DESCRIPTION:** Radical-initiated (OH and $NO_3$) environmental chamber reactions of specific DMNs, chosen based upon their abundance in ambient air, will be conducted. The chamber reaction products on adsorbent materials, extracting, subjecting to HPLC fractionation and analysis by GC/MS will be collected. Products using Solid Phase Micro-Extraction (SPME), including sampling with on-fiber derivatization to analyze carbonyl products, with GC/MS analysis will also be collected. Specific nitro-DMNs, either after *in-situ* formation from the $NO_3$ radical reaction of a DMN or after synthesis by nitration of the DMN with $N_2O_5$ in $CCl_4$ solution will be photolyzed and products with an emphasis on quinones will be analyzed.

**BENEFITS:** PAH-quinones formed via atmospheric reactions of PAHs emitted in vehicle exhaust may cause serious morbidity/mortality of Californians. This pilot study will provide data needed for future assessments of the human health risk associated with atmospheric reactions of traffic-derived PAHs.

**COST:** $120,000

**TITLE: Identification and Atmospheric Reactions of Polar Products of Selected Aromatic Hydrocarbons**

**PROBLEM:** The polar, oxygenated and nitrated, photooxidation products of aromatic hydrocarbons are poorly understood. While aromatics are known to be significant precursors to secondary organic aerosols, their reaction products in many cases have not been identified, and their toxicity and subsequent fate in the atmosphere are unknown.

**PREVIOUS WORK:** Using Solid Phase MicroExtraction (SPME) techniques, the formation of hydroxycarbonyl products from two biogenic alcohols and a series of *n*-alkanes has been investigated. Additionally, the formation and reaction of an unsaturated di-aldehyde, $HOCH_2CH=CHCHO$, from the OH radical-initiated reaction of 1,3-butadiene has also been investigated. From its time-dependent concentration, a formation yield of ~22% and a rate constant for its reaction with OH radicals of ~$5.3 \times 10^{-11}$ $cm^3$ $molecule^{-1}$ $s^{-1}$ (which is 80% of its parent, 1,3-butadiene) has been derived.

**OBJECTIVES:** To identify and, whenever possible, quantify dicarbonyl and hydroxycarbonyl products formed from the atmospheric reactions of selected aromatic hydrocarbons (including polycyclic aromatic hydrocarbons, PAH). The reaction rates of these carbonyl-containing products with hydroxyl radicals and their photolysis rates will be measured, as will the products of these processes.

**DESCRIPTION:** SPME fibers pre-coated with PFBHA [O-(2,3,4,5,6-pentafluoro-benzyl)hydroxyl-amine hydrochloride] will be used to allow on-fiber derivatization of carbonyl-containing compounds with subsequent thermal desorption and gas chromatographic analysis of these carbonyl compounds as their oximes. Identification will be made by GC-MS and analysis by GC-FID during OH + aromatic reactions will provide the time-concentration behavior of the carbonyl product(s). These data allow the rate constants for reaction (with OH radicals and/or photolysis) of the product(s) to be determined. This approach will allow the investigation into the formation and reactions of carbonyl-containing products (unsaturated 1,4-dicarbonyls such as C(O)CH=CHCH=CHCHO and possibly di-unsaturated dicarbonyls and unsaturated epoxy-1,6-dicarbonyls) from the OH radical-initiated reactions of aromatic hydrocarbons such as toluene and xylenes and selected PAHs. Many of these compounds are not commercially available and cannot be analyzed by gas chromatographic methods without prior derivatization.

**BENEFITS:** This project will provide data needed for assessments of the human health risk associated with sources of aromatic hydrocarbons, such as gasoline and diesel fuels, as well as provide atmospheric chemistry data needed to formulate more scientifically accurate computer models of air pollution, including the formation of secondary organic aerosols.

**COST:** $50,000

**TITLE: Updated Chemical Mechanisms for Airshed Model Applications.**

**PROBLEM:** For maximum accuracy in predictions of effects of control strategies on air quality, models must use the most up-to-date mechanisms available to represent formation of secondary air pollutants such as $O_3$ and secondary PM or air toxics. The most up-to-date California regulatory modeling uses the SAPRC-99 mechanism, which reflects the state of the science of the late 90s. However, important uncertainties remain and research yielding new information is continuing. For example, recent environmental chamber and other data indicate that this mechanism has significant errors in simulating effects of aromatics on $O_3$ and radical formation, and may underpredict $O_3$ formation rates in the high $NO_x$, low $VOC/NO_x$ conditions representative of many source areas. (Older mechanisms, such as CB4, are probably even worse in this regard.) In addition, prediction of secondary PM is becoming important, but existing gas-phase mechanisms were not designed for this purpose. Because of this ad-hoc parameterized approaches are used to append PM-forming processes to such mechanisms. Continued reliance on SAPRC-99 or older mechanisms in regulatory models without at least some ongoing mechanism development research will leave California unprepared for the more accurate and scientifically-based modeling demands to support the more difficult control strategies required to ultimately achieve mandated clean air standards.

**PREVIOUS WORK:** California supported the development of the SAPRC-99 mechanism for $O_3$ reactivity scales for VOC regulations. A project to evaluate and adapt the mechanism for low $NO_x$ conditions is underway, but this does not cover the effort required for major mechanism updates and making needed improvements to the aromatic mechanisms. Work is underway elsewhere in the U.S. to develop improved condensed mechanisms, but efforts to relate these to the detailed, fundamental chemistry of organics is limited. Detailed mechanism development efforts are underway in Europe, but their evaluations against chamber data are not yet comprehensive and the formulations of most of the European mechanisms are not yet suitable for use in models used in California.

**OBJECTIVE:** Develop and comprehensively evaluate an updated detailed mechanism that incorporates new data, improves representations for aromatics and PM precursors, and reduces uncertainties in estimated mechanisms for species where no data are available. Obtain environmental chamber data most needed to support this objective.

**DESCRIPTION:** The SAPRC-99 detailed mechanism and its associated mechanism generation system will be revised and extended to incorporate the above objectives. This will involve major changes to the aromatics mechanisms, adding lumped intermediate and species to appropriately represent PM precursors, and conducting new chamber experiments, most with PM data, most needed for its evaluation. The predictions of the mechanism will be comprehensively evaluated against existing and new chamber data.

**BENEFITS:** Regulatory agencies and researchers will be able to incorporate a detailed and scientifically based mechanism in their models for predictions of $O_3$, PM, air toxics, and VOC reactivity that represent the current state-of-the art and that is not inconsistent with new environmental chamber data. This support is also needed to assure a continuation of a mechanism development effort in California that otherwise may be lost.

**COST:** $150,000

**TITLE: Relationship of Ventilation and Building Characteristics to Contaminant Levels in California Classrooms**

**PROBLEM:** A wealth of data was collected in the California Portable Classrooms Study (PCS) on classroom characteristics; ventilation system type, operation, and maintenance; contaminant levels in indoor air and in floor dust; and other factors. These data have not been fully analyzed: only basic frequency distributions and very limited ANOVA modeling have been completed to date, due to the time constraints related to public review and delivery of the Report to the Legislature, and collection of more data than was originally budgeted. The PCS is unique in its breadth and representativeness. Further analysis of the more detailed information included in the data, especially to further examine relationships between ventilation / building characteristics and contaminant levels in the floor dust, would provide data useful to the California Energy Commission for refinement of school ventilation standards, and to the Division of the State Architect, and other state agencies to further improve classroom specifications and operation and maintenance practices.

**PREVIOUS WORK:** The PCS examined kindergarten through 12th grade portable and traditional classrooms throughout California. The results of the PCS indicated numerous, widespread environmental health problems in both portable and traditional classrooms. Most classrooms exceeded acceptable noise levels (primarily from ventilation systems) and formaldehyde levels. Many also did not meet acceptable guidelines or standards for temperature, humidity, lighting, and ventilation. Additionally, many classrooms had numerous pesticides, polycyclic aromatic hydrocarbons, and metals in the floor dust, some of which may pose a serious health risk.

**OBJECTIVES**: To review and statistically analyze data that are pertinent to school building performance issues – especially mechanical and natural ventilation, lighting, and thermal comfort – and their relationships to indoor contaminant levels and environmental conditions.

**DESCRIPTION:** The Contractor will: 1) Complete the statistical analysis of energy-related characteristics of portable and traditional classrooms from the PCS. 2. Complete the floor dust laboratory analyses. 3. Examine the relationships among key building performance variables, contaminants in indoor air and floor dust, and indoor environmental conditions.

**BENEFITS:** The data will be used by the California Energy Commission to assess possible changes to the energy efficiency/ventilation standards for California's school buildings; by the Division of the State Architect and other state agencies to revise portable classroom specifications, school operation and maintenance practices, and building design and construction; and by ARB, DHS, and others to better estimate the potential risk to students and teachers from floor dust and air contaminants.

**COST:** $100,000 (funded by CEC)

**TITLE: Characterization and Quantification of Emissions from Office Machines**

**PROBLEM:** Office machines such as photocopiers, printers, FAX machines, and computer terminals emit a variety of toxic pollutants as part of their normal operation. These pollutants can include volatile organic compounds, formaldehyde, particles, ozone, PAHs and nitrogen dioxide. The machines are operated in enclosed spaces and often with inadequate ventilation, which may lead to elevated levels of pollutants in the office environment. Office workers have complained of odors associated with these machines, and have reported health symptoms such as headache, mucous membrane irritation, and eye irritation that may be linked to pollutants associated with these machines. Voluntary industry effort has focused on reducing emissions, but it is not known how effective that effort has been.

**PREVIOUS WORK:** In 1998, the U.S. EPA published a report entitled *Indoor Air Emissions from Office Equipment: Test Method Development and Pollution Prevention Opportunities*. The authors concluded that there is a general lack of published emissions data on office machines. The report contains a draft test method compiled by a committee of EPA, industry, and Research Triangle Institute representatives. The report also discusses opportunities for pollution prevention associated with office machines. In addition to the EPA report, studies of office machine emissions have been conducted outside the U.S. over the last decade, in Australia and Denmark. More recently, Syracuse University in New York has established a new research center that is conducting emissions research with funding from U.S.EPA.

**OBJECTIVES:** To characterize and quantify the emissions from several types of commonly used office machines, and to examine approaches to reduce emissions and exposures from office machines. Pollutants will be identified and measured while the equipment is idle (standby mode), while operating under typical conditions, and while operating under purposely-varied conditions anticipated to result in reduced emissions or exposure.

**DESCRIPTION:** Investigators will select office machines for emission testing based on California markets, state purchasing practices, and other criteria. The machines will be monitored in different operating modes in a controlled-environment large chamber, so that emissions can be accurately characterized under variable conditions. Work will complement related research.

**BENEFITS:** Characterization of the pollutants emitted by office machines will allow ARB and California Energy Commission staff to determine user exposures to a variety of Toxic Air Contaminants and criteria pollutants. Knowledge gained in the study can be used to reduce emissions and exposures, assess ventilation needs, and direct educational efforts for improving indoor air quality.

**COST:** $800,000 (to be funded by CEC)

**TITLE: Energy Efficiency, Indoor Air Quality, and Human Health in New Homes**

**PROBLEM:** New California homes are built using materials that can emit formaldehyde and a variety of volatile organic chemicals (VOCs) and semi-volatiles listed as California Toxic Air Contaminants. They are also built to meet California's stringent energy efficiency regulations, which have reduced the natural air exchange between indoor and outdoor air. Concerns have been raised regarding whether current energy-efficiency requirements result in insufficient fresh outdoor air to dilute indoor contaminants and moisture. CEC is considering the need to require mechanical ventilation to assure a minimal level of fresh outdoor air exchange in new homes.

**PREVIOUS WORK:** Building materials are known sources of VOCs and semi-volatile contaminants, including some that can cause cancer and other serious health effects, and many that can irritate mucous membranes and the lungs. Large, residential indoor air quality studies that include VOCs and semi-volatiles have been conducted previously in California, but the most recent study was in 1989-1990, and no study has focused strictly on new homes. Since then, many new chemicals have been developed, and construction materials such as paints and caulking have been re-formulated. Additionally, new residential energy efficiency standards have been developed and approved by the California Energy Commission, and implemented throughout the state. These include requirements for ventilation, heating and cooling, insulation, appliances, and other factors that affect energy usage. These changes have resulted in a reduction in outdoor air exchange and triggered concerns regarding the impact of the energy requirements on indoor air quality and occupant health and comfort.

**OBJECTIVES:** To: 1) Collect and analyze data on indoor air quality, ventilation, air exchange rates, occupant health and comfort, and other factors from a large sample of owner-occupants of new California homes (less than one year old), with and without fresh air ventilators. 2) Examine the relationship between energy factors and indoor air quality, occupant health, and occupant comfort.

**DESCRIPTION:** Work will be conducted in two studies. First, investigators will conduct a mail survey of a large sample of new home owner-occupants to obtain information on building characteristics, ventilation, and occupant activities, and occupant comfort and satisfaction. Then, a field study (including a pilot study) will be conducted in a sub-sample of homes to obtain measurements of indoor air contaminants, energy efficiency characteristics and other factors. Homes from several climate zones will be studied in at least two seasons. Data will be analyzed and a final report prepared.

**BENEFITS:** This study will provide data on Californians' exposures to indoor contaminants in new homes, filling an important data gap for estimating Californians' indoor exposures to toxic air contaminants as required by HSC 39660.5. It also will provide information needed by the CEC to assess the impact of current energy efficiency standards and help determine the need for mechanical ventilators in new homes.

**COST:** Mail survey \$650,000; Field study \$950,000 (to be funded by CEC).

**TITLE: Factors Affecting School Bus Cabin Air-Tightness and the Relationship Between Air-Tightness and Bus Self-Pollution.**

**PROBLEM:** Recent tests of in-cabin air pollution concentrations on board school buses indicate a bus's own exhaust may be infiltrating into the bus cabin in significant quantities under some conditions. To better be able to understand this self-pollution effect and what factors are involved, more study is needed of how and when bus exhaust infiltrates into the cabin, and what factors lead to bus cabins being vulnerable to self-pollution. Measures to reduce bus cabin infiltration (e.g., sealants, maintenance practices, raising the exhaust outlet) may turn out to be a cost-effective means of reducing children's exposures during bus commutes.

**PREVIOUS WORK:** The recent Children's School Bus Exposure Study (Fitz et al., 2003) found some buses to contribute significantly to their own on-board pollution concentrations. This was determined through the use of $SF_6$ tracer gas added to each bus's exhaust. The extent of the self-pollution appeared to be a function of the bus's own emission rate and the infiltration rate of the bus cabin, although the bus emissions rates were only indirectly measured, so this relationship could not be well quantified. Infiltration rates appeared to increase with bus age and mileage, but bus-to-bus variability was large. The Children's School Bus Exposure Study as well as other in-vehicle studies has also shown closed-window air exchange rates are a strong function of vehicle speed (or air speed).

**OBJECTIVE:** To better understand the self-pollution effect in school buses by examining what affects bus exhaust infiltration into the cabin and what measures can be used to reduce cabin infiltration.

**DESCRIPTION:** A representative sample of school buses will be tested for leaks under slight positive pressure to identify the locations, visual conditions, and related characteristics of likely points of exhaust intrusion. The same bus will also have closed-window air exchange rate tests performed at low and zero wind speeds to test the relationship between closed-window air exchange rates and leaks.

A subset of the buses will have exhaust intrusion tests performed using a tracer gas added to the exhaust to see how well self-pollution is related to leak tests and air exchange rates, and to see under what conditions self-pollution seems to be occurring, such as low or zero speeds, sudden decelerations, when bus doors open, or during certain wind directions relative to the bus. A small subset of the buses showing significant infiltration effects will, where practical, be modified in an attempt to reduce infiltration, and have leak testing and air exchange rate tests repeated. These measures might include new sealing around windows and emergency doors, repair of window latch mechanisms, and raising the exhaust outlet (if safety concerns can be overcome).

**BENEFITS:** Many school districts cannot afford new buses or particulate trap retrofits. If simple maintenance, specific repairs, or avoidance of certain operating conditions can reduce infiltration of a bus's exhaust and its self-pollution, exposures for children riding older and dirtier buses might be able to be significantly reduced at little or no cost.

**COST:** $300,000 ($150,000 from ARB and matching funds from other sponsors)

**TITLE: Evaluation of the In-Use Not-To-Exceed Requirements for Heavy-Duty Diesel Engines**

**PROBLEM:** Heavy-duty diesel engines/vehicles (HDDEs/HDDVs) are substantial contributors to the motor vehicle emissions inventory for $NO_x$ and particulate matter (PM). In the 1990s it was found that seven of the largest HDDE manufacturers violated certification regulations by defeating emissions controls during in-use highway driving. As a consequence of these violations, the USEPA, and ARB negotiated the Consent Decree (CD) and Settlement Agreement (SA), respectively with these HDDE manufacturers. The CD and SA stipulate the implementation of in-use Not-To-Exceed (NTE) requirements. The NTE requirements call for the HDDE manufacturers to perform in-use emissions measurements and report results to the USEPA and ARB. The CD and SA NTE requirements have been carried over into the upcoming 2007 HDDE emissions standards, and the ARB has also adopted NTE requirements for 2005-06. The NTE requirements are expected to result in compliant in-use HDDEs, but this has not been independently verified.

**PREVIOUS WORK:** The USEPA/Engine Manufacturers Association (EMA) Calibration Standards Task Force and NTE in-use Measurement Workgroup have been working to implement the 2007 emissions standards, including the NTE requirements for HDDEs.

**OBJECTIVE:** The objective of this project would be to perform in-use HDDE/HDDV testing to verify the in-use emissions performance of post-1998 HDDEs complying with the NTE requirements.

**DESCRIPTION:** A small fleet of in-use HDDVs would be emissions tested, including over-the-road testing, and dynamometer testing. On-board emissions measurement instrumentation would be utilized as part of all emissions testing, including dynamometer testing. The over-the-road NTE testing would include typical HDDV in-use operation, while dynamometer testing would include the HDDE Federal Test Procedure (engine testing), and transient and steady-state test cycles. The emphasis of the project would be on $NO_x$ plus non-methane hydrocarbons, but consideration would also be given to PM measurements.

**BENEFITS:** The results from this project would permit a rigorous and systematic comparison of on-board, over-the-road emissions measurements against laboratory emissions measurements to permit an evaluation of the NTE requirements as a means of ensuring in-use compliance for HDDEs.

**COST:** $400,000

**TITLE: Advanced Collaborative Emissions Study (ACES).**

**PROBLEM:** Many of the most significant adverse health effects that are ascribed to exposures to diesel engine exhaust – including potentially increased risks for lung cancer – are premised on studies that relied on estimated exposures to diesel engine products from previous decades, specifically the 1960s and 1970s. The relevance of those studies and conclusions is becoming increasingly questionable, especially in light of the advanced diesel engines, aftertreatment systems, and ultra-low sulfur diesel (ULSD) fuels that will be entering the on-highway diesel vehicle market by 2007. Thus, there is a critical need for new emissions characterization and health studies of the exhaust from prototype 2007-2010 diesel engines equipped with advanced aftertreatment systems and operating on ULSD fuels.

**PREVIOUS WORK:** The Health Effects Institute (HEI) and the Coordinating Research Council (CRC) have been working in tandem to develop a detailed outline for the ACES program. HEI will be responsible for overseeing the health testing development, implementation and overall reporting of results. CRC will be responsible for overseeing the emissions characterization work of the ACES project.

**OBJECTIVE:** There are three principal objectives to the ACES initiative: (1) to produce a high-quality and health-relevant characterization of the emissions from advanced technology heavy-duty, on-highway diesel engines equipped with aftertreatment controls and operating on ULSD fuels; (2) to develop and apply best methods for researching and testing the potential public health implications of those emissions; and (3) to provide a state-of-the-science commentary evaluating the changes in emissions and potential risks from prototype 2007-2010 diesel engines.

**DESCRIPTION:** CRC will oversee a series of detailed studies to characterize and speciate prototype diesel engine exhaust, with special emphasis on ambient exhaust characteristics as may be experienced by a near-source receptor. HEI will oversee a series of health studies, including acute and chronic toxicity/inhalation studies, of the relevant prototype exhaust samples to assess both short and longer term potential effects of exposure, focusing on inflammation, asthma, allergic response, lung cancer and other key end-points. A synthesized commentary that can be used to inform public policy decisions pertaining to advanced technology diesel engines will be the final work product of the ACES program.

**BENEFITS:** The ACES program may provide useful, policy-relevant new information and background for an informed assessment of the technological advantages of advanced prototype diesel engines – greater fuel efficiency and reduced $CO_2$ emissions to help address climate change concerns.

**COSTS:** The overall cost estimate for the ACES program is approximately $5MM-$7MM over a five-year period. It is envisioned that multiple stakeholders from the private and public sectors will help to sponsor and underwrite the ACES initiative. The ARB's contribution may be up to $50,000.

**TITLE: Low-Cost, Easy to Use, Monitoring Technologies.**

**PROBLEM:** More and better air quality data are needed for power plant siting cases, to evaluate the air quality impacts of distributed generation, and to address environmental justice concerns. These limitations hinder the ability to identify areas disproportionately affected by air pollution and to determine the air quality impacts of new sources (e.g. power plants) – particularly for distributed generation technologies.

**PREVIOUS WORK:** A report by Clarkson University, which was sponsored, by the California Energy Commission (CEC) and the New York State Energy Research and Development Authority, surveyed available monitoring methods and those in development. Investigators identified instruments and technologies suitable for use in ambient and indoor air monitoring. The focus was on measurement of particulate matter, mass and constituents, gaseous nitrate, nitrogen dioxide and gaseous $NO_y$, particle size distributions, particulate carbon species and volatile organic compounds. The pollutants of concern included those on the Photochemical Assessment Monitoring Stations list, toxic air contaminants, particle-bound elemental carbon and organic carbon; and other particulate matter components. The investigators found that there are important problems with monitoring systems – particularly with respect to cost, sensitivity and selectivity.

Under the Innovative Clean Air Technologies Program, the CEC and ARB are currently funding two projects in this area, entitled, "Development of a Low-Cost Particulate Matter Monitor", and "A Simple, Low-Cost Beta Attenuation Monitor (BAM) for Continuous Measurement of PM10, PM2.5, or Ultrafine Particle Counter."

**OBJECTIVE:** To further develop inexpensive portable instruments that can provide location specific ambient and indoor air monitoring.

**DESCRIPTION:** The CEC and the ARB will provide funding to contractors who demonstrate the ability to develop new technologies for measuring air pollution in the ambient or indoor air. The focus is developing low-cost, easily operated, air-monitoring technologies that are suitable for wide deployment.

**BENEFITS:** The use of portable monitors may improve the data available for power plant siting cases, environmental justice concerns, local community monitoring, and indoor/personal exposures, while significantly reducing the cost of obtaining monitoring data.

**COSTS:** The CEC and the ARB will each provide $282,585.

**TITLE: Climate Change - Characterization of Black Carbon and Organic Carbon Air Pollution Emissions and Evaluation of Measurement Method**

**PROBLEM**: In contrast to greenhouse gases, which have a warming effect, aerosols can influence both sides of the energy balance. Sub-micron aerosol particles (less than 1 µm) are highly effective at scattering solar radiation, sending a substantial portion of that scattered radiation back to space, and consequently cooling the Earth. While particles of any composition can reflect light back to outer space, only a few can absorb light. These include black carbon (BC) or "soot", desert dust, and some organic carbon (OC) species. Of these, BC is thought to dominate light absorption by aerosols in many regions, and it is the most efficient at absorbing visible light. It has been proposed that reductions of BC particles may slow the rate of global warming. However, BC is emitted simultaneously with OC, which has a net negative climate forcing. Hence, the net climatic effect of reducing emissions of fine particles is ambiguous until, at least, the relative amounts of BC and OC are known.

For the purposes of climate change emissions inventories, BC is defined as the carbon component of particulate matter that absorbs light. However, this specific component of particulate matter is difficult, if not impossible, to measure. Methods that measure light absorption in particulate matter assume that BC is the only light absorbing component present; however, some components of OC may also be light-absorbing; in this case, inventories of BC and OC may have overlapping impacts

**PREVIOUS WORK:** Emissions inventories of BC developed to date have focused on industrial, utility, and residential combustion sources. On a global basis, residential emissions represent the largest source of BC. In the U.S., however, Battye et al. (2002) estimated that off-road and on-road diesel sources are the major BC sources (36% of total BC emissions), based on the National Emissions Inventory (NEI) and BC speciation factors. Gasoline vehicles represent a smaller (8%), but non-negligible source of BC emissions. Due to the abundance of these sources in California, on-road and off-road mobile sources likely contribute to significant BC emissions in this state as well.

Most source-characterization studies do not measure BC, but rather so-called "elemental" carbon (EC). This type of measurement is widely used in air-quality and source-characterization applications. Even the results of similar methods may differ based on the procedure used. Future work should include a treatment of the relationship between each measurement method and the quantity of interest—i.e., light absorption. Further, carbon that absorbs light may not be black, and its molecular form may differ from that of BC [Bond, 2001]; these differences are implicitly ignored in most, if not all, studies.

**OBJECTIVE:** This project would compare and contrast results from laboratory and an ambient air field study of particulate carbon testing/sampling using optical and filter-based sampling techniques, both in laboratory source testing and ambient measurements. This project would also clarify the role of different combustion processes in determining emission rates of BC and OC to the atmosphere including the uncertainty inherent in these factors. A comprehensive review of literature on combustion processes and source characterization would be included to support the selected emission factors.

**DESCRIPTION**: This project would have two main components: 1) measurement method evaluation and 2) determination of emission rates of BC and OC. Measurement method evaluation would involve A) a laboratory comparison of EC/OC fractions and a comparison of EC results versus BC results using currently accepted analytical method, and B) an ambient sampling comparison of EC/OC fractions and comparison of EC versus BC using currently accreted sampling methods. For part A, methods evaluation need to be implemented on a small set of collocated laboratory instruments that can be calibrated with the same standards, use the same gases, and that have demonstrated cross-comparability. For part B, ambient sampling would be conducted at locations known to have different carbon contributions from motor vehicle exhaust, wood burning, cooking, etc.

Previous "bottom-up" inventories of BC and OC have assigned emission factors based on fuel type and economic growth factor alone. Because emission rates are highly dependent on the actual process used to determine them, this research project will consider the effects of fuel type, combustion process type, emission control, and their prevalence on a regional basis, with special attention to the residential and transportation sectors. A comprehensive literature review and limited source tests of the most critical sources will be conducted. Specific tasks could include: 1) particulate matter emission factors for technologies that have not been well studied (residential combustion sources, traditional industry, super-emitters); (2) speciation of PM (in particular from high-emitting technologies) into BC and OC and comparison of the results with ambient measurement; this especially affects BC emissions, and involves measurement uncertainties as well as population variability; and (3) analysis of technology divisions in sectors that contain even a small fraction of highly-polluting devices.

**BENEFITS:** Most studies have treated measurements of EC as equivalent to BC, introducing a substantial uncertainty. The scientific and regulatory communities would both benefit from a better understanding of how EC compares against BC. This project will also result in a quantitative understanding of the effect of different combustion sources and their particle emissions, in particular BC and OC, on air pollution and climate change. Particulate emissions are believed to play a significant role in global warming. Furthermore, unlike the benefits associated with reductions in greenhouse gas emissions which take decades to fully realize, reductions in particulate matter emissions yield immediate improvements due to their short atmospheric lifetime. Therefore, efforts to better characterize and subsequently control particulate matter can have an immediate and potentially profound impact on addressing global warming.

**COST:** $400,000. Potential co-funding sources include U.S. EPA, EPRI, CRC, SCAQMD, etc